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**UNIVERSITY OF CAPE TOWN**

**PREDICTING EMPLOYEE VOLUNTARY TURNOVER USING HUMAN  
RESOURCES DATA**

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Dissertation submitted in partial fulfilment of the requirements for the degree of the  
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**COMPULSORY DECLARATION:**

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in this dissertation from the work, or works of other people has been attributed, and has been cited and referenced.

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## ABSTRACT

The inadequate availability of competent and motivated employees has repeatedly been cited as one of the major constraints of economic growth in South Africa. This skill scarcity is further exacerbated by employee turnover, and its effects on business have been the topic of many research articles. The current research attempted to answer the following question: *Can voluntary employee turnover be predicted?*

The study made use of regression analyses to examine the relationship between employee turnover and a range of worker demographics. Data covering 2 592 employees in a South African general insurer formed the basis for the analysis. Several demographic variables (available in the HR management information system), were identified and investigated with the aim to develop a voluntary turnover prediction model. Fourteen variables were identified in the human resources information system to be included for analysis. From 14 potential predictors, the procedure selected only five variables, i.e. cost centre, years of service, performance, age and tenure–family size interaction for inclusion in the regression equation.

Keywords: voluntary turnover, demographic variables, logistic regression, risk modelling, predictive modelling, job satisfaction

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# **CHAPTER ONE**

## **PREDICTING EMPLOYEE VOLUNTARY TURNOVER USING HUMAN RESOURCES DATA**

### **1.1 Introduction**

Employee turnover is a challenge faced by many South African organisations with negative consequences (Booyesen, 2007). Turnover can be defined as the total movement of employees in and out of an organisation (Grobler, Warnich, Carrel, Elbert & Hatfield, 2006). In the last decades, the demand for skilled employee has continued to increase due to an increasing ageing population and growth in the local economy (Global Competitiveness Report, 2011-2012). South African organisations continually compete in attracting as well as retaining skilled employees in an already skill-deficit country. Retention of skilled employees thus becomes a strategic imperative and critical to business success. Consequently, understanding turnover is a prerequisite to business sustainability.

### **1.2 Background and motivation**

Good performance and sustainability of organisations cannot be realised without the support and contribution of employees. Employee turnover presents a threat to business sustainability and a dynamic challenge faced by businesses globally. Despite the economic downturn, turnover remains one of the most relevant and significant issues in human resources management (Vance, Vaiman & Andersen, 2009; Robison, 2010). Turnover is likely to be particularly severe where experience is a critical prerequisite for successful work, where replacement is expensive, and where turnover is disruptive and demoralising to the remaining workforce (Allen, Bryant & Vardaman, 2010). It can also have a negative impact on the organisation by acting as a counter-culture to the organisation's business objectives (Saari & Judge, 2004). This is particularly true when objectives such as service quality and reduced costs are sources of competitive advantage for an organisation.

Other turnover consequences include reduction in customer satisfaction, productivity and profit (Harter, Schmidt & Keyes, 2003). Significant direct costs, related to recruiting and replacement, and indirect costs related to retraining, as well as loss of organisational knowledge and experience are further costs associated with employee turnover.

Estimates that the total cost of replacing employees could exceed 100% of the annual salary are valid. Therefore, recruiting, developing and retaining people are significant activities in the business world in which intellectual capital and organisational capabilities are key sources of competitive advantage (Pfeffer, 2005). Organisations that fail to retain employees are left short-staffed and with a reduced number of qualified workers. In due course, this will deter their ability to remain competitive (Rappaport, Bancroft & Okum, 2003).

The impact of South African legislation aimed at redressing historical racial and gender practices exacerbates the turnover problem. Various explanations seek to explain the skills deficit, e.g. rapid economic growth, increasing need for infrastructure, buildings and electricity. A number of factors, together with the fact that the baby boomers (born 1946–1964) are retiring, are driving the discussion on the quantity and quality of available skills (Rappaport et al., 2003). There is agreement that the global skills shortage serves to intensify the importance of managing employee turnover. Justifiably this has become a major concept within organisational psychology and people management literature. The most common explanation for such prominence is that turnover management has become a major source of competitive advantage in the modern and rapidly globalised business world. Retaining skills becomes a key differentiator, particularly in the South African context (Peralta, 2006), where the skills shortage is an economic barrier to growth. Hence, it becomes necessary for organisations to manage employee turnover to ensure organisational viability (Pfeffer, 2005).

The Global Competitiveness Report, 2011-2012 ranks South Africa 50th in the ranking of competitiveness out of 59 nations, indicating a decline from the previous year. The International Institute for Management Development (IMD) generated the rankings using 331 criteria ranging from gross domestic product growth and unemployment, to the number of Internet users and the price of local cellphone calls.

Other criteria include availability of skilled employees, government regulation, availability of venture capital, and various qualitative factors. Furthermore, the IMD report shows that a critical component of competitiveness includes having the appropriate skills quota across a range of occupations and professions as well as the skills to drive leadership in organisations (Global competitiveness Report 2011-2012).

Erasmus and Breier (2009) investigated the problem of skills shortages in various occupational fields in South Africa against the local, political, historical and international background. They discovered an inadequate education system (still struggling to overcome decades of dysfunction under apartheid) as well as the decline of the apprenticeship system leading to a shortage of artisans and the loss of senior specialist skills as a result of affirmative action (Erasmus & Breier, 2009). In addition, international influences favour the mobility of skilled local professionals who are encouraged and able to work anywhere in the world – albeit at the cost of developing countries (Erasmus & Breier, 2009).

In defining employee turnover, Fields, Dingman, Roman and Blum (2005) specify that it is the action of leaving a current job or employer. Griffeth, Hom and Gaertner (2000) further define the concept by referring to voluntary and involuntary employee turnover. With voluntary turnover, the employee initiates separation from the organisation, whereas involuntary turnover is initiated by the organisation, often because of poor job performance or organisational restructuring (Allen, Bryant & Vardaman, 2010). As a result, voluntary employee turnover is one of the most studied behaviours in organisational research (Maertz & Campion, 2004) and formed the background for the current research.

The factors influencing employee turnover have been the focus of major discussion in the multidisciplinary field of psychology (Kane-Sellers, 2008). Previous research has focussed on environmental causes of turnover (Zimmerman, 2007). These investigations have led to an under-emphasis of individual and group differences, e.g. employee characteristics, as a contributor to the individual's turnover decisions (Tyagi & Wotruba, 1993). To manage turnover it is essential to identify the variables influencing an individual's decision to leave an organisation, take steps to address the causes and plan and implement retention policies accordingly.

Consequently, in their retention strategies, organisations use targeted and untargeted approaches in managing employee turnover. Untargeted approaches rely on generic organisational practices to increase organisational commitment and retain employees, allowing organisations a variety of strategies to retain their multigenerational talent (Westerman & Yamamura, 2007). These strategies include increasing compensation and benefits, promotions, opportunities to learn, special assignments and status-driven incentives. Other untargeted non-monetary retention strategies include increased flexibility and work-at-home options, flexible control over work schedules and additional opportunities to develop skills and knowledge during work time or through employer-funded educational programmes (Westerman & Yamamura, 2007). Effective retention strategies hinge on reliable, timely intelligence about prospective leavers (Trevor, Gerhart & Boudreau, 1997; Lyness & Judiesch, 2001) as turnover risk management is becoming an important strategy to ensure the organisational stability. As an alternative, targeted approaches rely on identifying employees who are likely to leave, and then providing them with either a direct incentive or a customised plan to ensure that they stay. The targeted approach relies greatly on the availability of appropriate and reliable data. Most organisations have considerable amounts of data at their disposal, but often fail to utilise such data in any meaningful way, e.g. HR management data.

### **1.3 Propensity for prediction**

In the medical world, doctors seek to identify those treatments that help patients survive longer – and those that have no effect at all. Similarly, in the business world, the equivalent concern is with customer attrition; nonetheless, analytics present a powerful business tool for organisations to leverage their internal data in key business decisions and processes (Linoff, 2004). In their book, *Competing on Analytics: The New Science of Winning*, Davenport and Harris (2007) reveal how innovative organisations in their study were constructing their strategies around the intelligence garnered through their analytical capabilities. Rather than going on a hunch when pricing products, maintaining inventory or recruiting, managers in these organisations used data analysis and systematic reasoning to make decisions that improved

efficiency, increased profits and assisted with risk management (Davenport & Harris, 2007).

Propensity modelling is the collective name for a new group of statistical techniques that provide an objective view of the likely behaviour of an individual. Insurance industries, as early adopters of these methodologies, use analytics to determine the riskiness of taking on a particular customer. Banks use similar methods to predict and prevent credit fraud, thus saving millions. Pharmaceutical companies use such methodologies to get life-saving drugs into the market more quickly. Even sports teams are using analytics to determine both game strategy and optimal ticket prices. Therefore, one could argue that organisations would be able to manage employee turnover risk the same way as any other business risk.

Risk management is at the core of the insurance business, where actuarial statistics have been the traditional tools of trade in forecasting various aspects of risk such as attrition, accident, health claims or disaster rates, including the severity of these claims (Hong & Weiss, 2001). Therefore, providing insights to support informed decision-making is the primary objective of risk management. New strategies are emerging that go beyond traditional solutions, and that are building the capacity to retain well-performing employees. Human resources practitioners have not explored the opportunity that exists within mathematical models that could be useful in identifying the early stages of turnover intent.

Key risk indicators (KRIs) play a critical role in any risk management framework. Organisations that are able to manage their employee turnover risk would have a competitive advantage over those that are not. Predictive modelling could offer human resources professionals further rationale for evaluating their practices based on reduced cost of turnover, enhancing their strategic role in the organisation while encouraging developmental goals at individual level (Mak & Sockel, 2001).

Although no standard framework for understanding the employee turnover process exists, a broad range of factors has been postulated for understanding employee turnover. Researchers and practitioners continue to grapple with turnover factors and their connecting relationships. Earlier studies (Griffeth, Hom & Gaertner, 2000; Price, 2001; Kirschenbaum & Weisberg, 2002) found that variables, which predict employee

turnover, could vary significantly across situations. Muchinsky and Tuttle (1979) grouped turnover studies as a simple list based on common predictors and included employee characteristics (e.g. age, education, gender and years of service), the nature of the current job, the nature of the organisation, and external conditions (e.g. the unemployment rate).

Large organisations have turnover indicators based on historical data, e.g. the exit interview. Using the data extrapolated from the exit interview, the usual revelations are a lack of challenging work, perceived lack of career opportunities and dissatisfaction with managers or management.

Predictive modelling presents an application prospect for human resources (HR) practitioners in the field of employee turnover. Understanding to what extent demographic variables can predict turnover would be very useful, as the data needed for such predictions are visible and readily available to managers, other than the attitudinal measures (e.g. job satisfaction, organisational commitment) used to explain employee turnover prediction.

Predictive models are now widely used in many business applications to predict the occurrence of events (Saradhi & Palshikar, 2011) and the current study used an application to identify the likelihood of employee turnover. The present study differed from other traditional turnover research in that it employed a unique approach to predict turnover. Most previous studies have focussed on the impact of attitudinal factors such as job satisfaction and organisational commitment on turnover intentions and less on the influence of individual characteristics on turnover intentions. A unique aspect of the current study lies in the number of demographic variables and the selection of statistical treatments of employee turnover that were utilised. Within this context, the present study connected at the concept of employee turnover and the demographic factors that influence this phenomenon, using risk-modelling techniques.

#### **1.4 Problem statement**

The study organisation like most companies was faced with the challenge of dealing with employee turnover, especially in highly technical fields and specialised business units. Turnover also significantly affected the efficient functioning of the



organisation, as the loss of skills and organisational competencies in the organisation's specialised environment could not easily be replaced. It was difficult for the organisation to achieve its desired strategic goals without the required number of employees and therefore losing employees became a big problem. Despite a significant amount of literature available on turnover, there was no generally accepted rationale or model of measurement. This prevented an accurate understanding of the turnover problem and prohibited prediction of turnover (Terborg & Lee, 1984). Few studies using risk-modelling techniques to predict the likelihood of an employee leaving were available. Given the attention directed at turnover and its negative consequences, it was not surprising that, when reviewing the literature, the most common theme that emerged was the attempt to predict turnover.

### **1.5 Aim and scope of the study**

Vandenberg and Nelson (1999) indicate that identifying predictive precursor variables to turnover is important for the understanding and the management thereof. The development of a predictive model to tackle the problem of employee turnover had inputs from secondary sources, and the current study was confined to data collected from a large general insurer.

The potential economic costs, productivity losses, missed business opportunities and even the threat to the sustainability of the organisation associated with turnover make it clear why employee turnover is such an important topic for both practitioners and researchers. The aims of the present study were varied. Firstly, it tried to enhance understanding between demographic variables and employee turnover. Secondly, it proposed a model, which can predict employee turnover by using demographic variables. This is in essence a stand-alone model for determining the probability of an employee staying or leaving, and it achieves this end mathematically. Thirdly, it wanted to provoke more thinking and reflection on measurement of employee turnover.

## **1.6 Research proposition**

Research proposition, rather than hypotheses, was used for the following reasons:

1. the study is of an exploratory nature; and
2. the research was not based on previous models and could be approached from a more pragmatic view.

Despite initial enthusiasm for using statistical techniques to gain new insights into employee turnover, little evidence of studies in the literature exists. The following proposition is offered:

### **Proposition 1**

Demographic variables can be used to build a model to significantly predict employees at risk of turnover.

## **1.7 Significance of the study**

Demographic indicators strongly suggest that the race for talented workers will reach global crisis levels due to the imminent retirement of the baby boomer generation and decreased birth rates throughout the developed world (Frank, Finnegan & Taylor, 2004). In addition to the management of skilled resources being of critical concern, there are other justifications for investigating turnover. Gaining an understanding of those factors that influence employee voluntary turnover can be instrumental in sustaining workforce stability. The results of the current study may also influence human resources development policies and practices. Current explanations of employee turnover fail to offer either predictive or explanatory power (Aquino, Griffeth, Allen & Hom, 1997). Not many empirical studies have been conducted to provide organisations with a diagnostic tool to the problem of turnover, particularly in the South African context.

## **1.8 Expected contribution to knowledge and practice**

Research in this area by mainstream organisational behavioural schools has evolved to the research of factors affecting employee turnover. Although there are comparatively few studies of employee turnover, based on statistical methods, sufficient data exist to begin to frame a research agenda designed to assess the value of predictive analysis, in studying turnover behaviour (Somers & Birnbaum, 1999). Given the growing complexity and uncertainty in many decision situations, managers are in urgent need of assistance to support their decision-making processes. Further applications are:

- Such a model could offer human resources professionals a further basis for assessing their practices based on reduced costs of turnover, enhancing their strategic role in the organisation while encouraging developmental objectives at the individual level.
- These predictions can help human resources (HR) teams to improve their policies and retain employees.
- Revision of retention strategies modelled against employee demographics.
- This research provides a considerable contribution to HR policy makers by understanding the importance of organisational support for the retention of a competent workforce.
- With costs in mind, organisational researchers have long been interested in predicting – and hopefully preventing – valuable employees from leaving their organisations.

For an organisation's human resources management (HRM), this kind of research pattern could be useful for talent retention, as it reveals comprehensive determining factors, helping managers analyse and diagnose the organisation's core employee movement.

## **1.9 Structure of dissertation**

This study used employees' demographical data such as age, gender, marital status, educational background, and work experience to predict turnover. The next section of the dissertation looks at a literature review investigating the various demographic variables (available in the organisation's HR information system) and the impact on turnover. Following that, the research method section describes the methodology employed during the study. Chapter 4 reports the quantitative results and descriptions of the results followed by the analysis of the relationship (interpretation of the results) and explanations that the researcher subscribes to the results. The dissertation ends with a discussion, concluding remarks and recommendations for further research. It also discusses the implications of these results in the light of the literature review. Finally, research limitations are identified and implications of the research are discussed in this last chapter.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter reports on the relevant literature on the relationship between various demographic variables (identified in the organisation's HRM system) and voluntary employee turnover. Selecting the individual as the unit of analysis does not mean that turnover research at the departmental, organisational, and attitudinal or any other combined level is not of value and interest. This review only evaluates the utility of different demographic variables in predicting voluntary employee turnover.

There are many reasons to study voluntary turnover. Such turnover can be costly and disruptive to the organisation. Recruitment, development and retention of talent form the basis for developing competitive advantage in many industries and countries (Pfeffer, 2005). In addition, while it may appear to be easily predicted by macro-economic data, decades of research propose that a rich understanding of individual behaviour under constantly evolving global and local conditions will necessitate continuous research effort.

Employee turnover is a much-studied concept with the literature focussing on the causes dating back to the mid-1900s. While several researchers have observed that work and non-work characteristics influence employee turnover, nevertheless turnover research has concentrated predominantly on work-related variables (Mobley, 1982; Mowday, Porter & Steers, 1982). Previously, researchers were directed by embedded paradigms (Mobley, 1982) and, despite progress in turnover research, concerns have been raised that the degree of incremental knowledge generated by these studies is limited (O'Reilly, Chatman & Caldwell, 1991). According to Somers and Birnbaum (1999), perspectives on employee turnover have changed. As a possible response to these opinions, new approaches to studying employee turnover are evident in recent turnover research. However, these studies represent a comparatively small proportion of turnover research.

## **2.2 Determinants of employee turnover**

In order to gain a deeper understanding of the phenomenon of employee turnover, and identification of the factors causing it, an assortment of literature on turnover, was studied in detail. Variables that generally predict employee turnover have been summarised in four meta-analytic studies (Cotton & Tuttle, 1986; Tett & Meyer, 1993; Griffeth et al., 2000). The most recent of these (Griffeth et al., 2000) categorised the predictors as –

1. employee demographics;
2. current job conditions; and
3. organisation and the external environment.

Demographic characteristics have been advanced in several models as predictors of turnover (Duemert, 2010; Bal, De Lange, Ybema, Jansen & Van der Velde, 2011) but few studies look at the demographic–turnover correlation in isolation, and frequently other organisational variables such as job satisfaction tend to form part of the study. This study restricted itself to literature containing employee demographics only. The following section highlights some of the research on each of the independent variables.

### **2.2.1 Age**

Demographic characteristics appear to influence the employee's decision to leave an organisation, with age being one of the most studied factors for this occurrence. Many meta-analytic studies have explored the relationship between age and employee turnover (Cotton & Tuttle, 1986; Ng & Feldman, 2009). These studies report an inverse relationship between age and turnover.

Researchers propose that age is a time-based variable that affects an individual's job mobility and stage in the personal and family life cycles (Somers & Birnbaum, 1999). Younger employees have higher turnover rates because of career fluidity, they are better prepared to relocate and have fewer domestic responsibilities and financial obligations than older employees (Bal et al., 2011). Older employees are less likely than younger ones to leave an organisation as they are embedded in their jobs and

therefore have a lower need to change jobs (Ng & Feldman, 2009). The explanations for this include that older employees have more investment in the organisation (e.g. pension plans and medical aid) and that they would therefore be at a financial disadvantage should they leave. Furthermore, older employees experience additional challenges in changing jobs as they are subject to negative stereotyping and age discrimination.

Various changes in the career environment over the last two decades may make age a more significant predictor of employee turnover. As organisational downsizing and restructuring have become common in recent years, younger workers are psychologically prepared to be mobile even at organisational entry level, particularly if continuous opportunities for advancement and variety are not forthcoming (Finegold, Mohrman & Spreitzer, 2002). Peralto (2006) indicate that younger generations put less importance on stability and benefits, which means that there is a greater probability of turnover amongst these groups. Not surprisingly, older workers may be hesitant to change jobs when job security is unstable and retrenchment and redundancies are widespread (Ng & Feldman, 2009). These authors further propose that the strength of the age–turnover relationship may have altered as debate around the nature of work in changing economies gains momentum (Tams & Arthur, 2010). In a meta-analysis of studies published between 1990 and 2008 (49 studies,  $N=71\,053$ ), it is reported that the age–voluntary turnover relationship was in fact stronger ( $r=-.14$ ) than the previously reported ( $r=-.08$ ) (Ng & Feldman, 2009).

A South African correlational study explored the relationships between demographic variables, job satisfaction and turnover intent amongst primary healthcare nurses in a rural area of South Africa (Delobelle, Rawlinson, Ntuli, Malatsi, Decock & Depoorter, 2011). In this study, it was found that job satisfaction, education and age negatively correlated with years of service (Delobelle et al., 2011). Age has consistently been shown to be negatively related to turnover intention (McBey & Karakowsky, 2001) although some authors point to the possible influence of age cohort effects and the moderating effect of age on the relationship between job satisfaction and turnover.

### **2.2.2 Years of service**

Steers (1977) suggests that years of service are the single best predictor of turnover. There is general agreement that years of service, like age, are negatively correlated with employee turnover (Blau & Kahn, 1981; Cotton & Tuttle, 1986; Griffeth et al., 2000). Like age, years of service are a time-based variable; hence, older workers are less likely to leave their organisations. While age and years of service are positively correlated time-based variables, they are not duplicate constructs (Arnold and Feldman 1982). Those with extensive years of service are less likely to leave because of financial reasons (i.e. pensions, benefits and salaries they have accrued) and financial disincentives (i.e. difficulty in recouping those rewards within the limited number of years left before retirement). Organisations are likely to provide attractive reimbursement and exceptional incentives to retain and motivate older employees. Hutchens (1989) and Ng and Feldman (2009) suggest that these extrinsic rewards exert strong embedding forces on long years of serviced employees and discourage them from seeking new employment opportunities.

Employee turnover is highest at the initial stages of employment, but it declines quickly after the first five years and then more slowly up to about 15 years of service (Lewis 1991; Hom, Roberson & Ellis, 2008). A key explanation for this tendency is that social contact in the workplace tends to create affinity and loyalty toward the organisation and its employees, thus reducing the propensity for turnover.

### **2.2.3 Gender**

Gender differences in labour turnover have received extensive coverage in employee turnover research. Gender as a correlate of turnover has been unconvincing as a factor in turnover prediction (Arnold & Feldman, 1982). Cotton and Tuttle (1986) and Weisberg and Kirschenbaum (1993) found that females are more likely to change jobs than males, whereas Wai Chi Tai, Bame and Robinson (1998) report no relationship between gender and turnover. Sicherman's (1996) study examined gender differences in turnover amongst a large sample of employees in an insurance organisation from 1971 to 1980 and found higher turnover rates (including involuntary turnover) for



females than for males. Sicherman (1996) hypothesised that the gender gap in turnover could be largely ascribed to the fact that the women in his study held lower-level jobs than the men. Interestingly, the reasons for female turnover tended to be for non-commercial reasons e.g. pregnancy and family responsibility.

Lyness and Judiesch (2001) also explored this concept, i.e. the relationships of gender, promotions and leave of absence to voluntary turnover among 26 359 managers in a financial services organisation. These researchers found that, contrary to their hypothesis, the voluntary turnover rates for female managers were slightly lower than those for their male counterparts (Lyness & Judiesch, 2001). Two possible conceptual and methodological explanations for this seemingly inconsistent situation are proposed that distinguish intent from actual turnover and disaggregate male and female components of the gender variable. The lower and less consistent labour force participation rates for women in contrast to men gave rise to the hypothesis that actual turnover behaviour and intent to leave will be gender-specific, as well as be influenced by differing sets of labour market and work environment factors. Research therefore remains mixed on the relationship between gender and employee turnover.

#### **2.2.4 Race and language**

Organisational demography, or relational demography, as it is known in the field of organisational psychology, is the influence of demographic configuration on organisational working. Research on relational demography specifies that an individual's level of demographic similarity to other employees positively influences outcomes (Tsui, Egan & O'Reilly, 1992). The relationship between perceived career mobility and organisational commitment seems particularly relevant to the South African context, as affirmative action legislation may increase the demand for black skilled workers; hence, greater mobility opportunities may be presented for this grouping (Avery, Volpone, McKay, King & Wilson, 2011). This highlights the need to explore possible differences in race groups' career mobility preferences.

Various theories suggest that higher turnover will occur in diverse workplaces, especially amongst those employees whose demographic characteristics put them in the numerical minority in the workplace (Leonard & Levine, 2006).

In understanding the race–turnover relationship, the researcher draws heavily on American research by Quillian, Cook and Massey (2006) who hypothesised that people tended to choose a neighbourhood in which his or her own racial group comprises half or more of the population. If these preferences are organisationally applied, employee turnover would be lower in homogeneous groups on condition that they are in the majority (Tsui et al., 1992).

Previous studies on the race–turnover relationship did not consider the unique South African context. Consequently, based on a different perspective in international human resources management and the current South African evidence from turnover literature (Arnold, 2011), which indicates that diverse groups of employees exhibit different tendencies to leave, one could question the applicability of established models in an emerging and culturally distinct economy such as South Africa.

In his study, Heymann (2010) found no evidence to suggest that race affected employee turnover. Mda (2010) found the opposite in a study involving ICT workers' decisions to terminate their employment, where it was discovered that affirmative action acted as a mobility motivator for blacks and a barrier for whites. A third South African study (Booyesen, 2007) focussing specifically on retention of talented black managers found that turnover amongst black South Africans was higher than other race groups. The ambiguous and unexpected findings of these studies provided an additional reason to conduct an updated investigation into turnover relationships.

There is also evidence that employees from diverse cultural backgrounds differ in how they respond to the same human resources practices. As a result, the retention capacity of human resources practices may vary substantially across cultures and their undifferentiated use may potentially generate adverse effects for employee retention (Newman & Nollen, 1996).

In investigating the link between language and employee turnover, the studies that were consulted often included culture and did not observe language in isolation. Diverse groups have more difficulty communicating, and communication difficulties can increase turnover (Price & Mueller, 1981).

### **2.2.5 Education**

Becker (1993) remarks that people make investments, such as attaining further education, training or experience to improve their competencies and the possibility to earn higher salaries. The personal needs or career ambitions of most employees may be directly related to educational level (Wai Chi Tai et al., 1998). Consequently, employees with a higher educational level show a greater propensity to turnover as there are fewer barriers to exit and (more access to several alternative job opportunities that provide greater financial reward) (Ng, Eby, Sorensen & Feldman, 2005). Knapp, Harissis and Missiakoulis (1982) performed a study where a number of demographic variables were combined to test the correlation with turnover, and they found age, gender, qualification and years of service statistically significantly linked with turnover. Using a logit analytical technique to determine the significance of each variable, the research indicated that the group with higher educational qualifications had a lower turnover (Knapp et al., 1982).

#### **2.2.5.1 Age and education**

While both older employees and employees with little formal education are more likely to face obstacles in finding an alternative employment market, older workers with little formal education face even greater challenges to find alternative employment. Therefore, older workers with higher levels of formal education are more likely than older workers with less education to find, receive and accept alternative job offers. The research studies suggest that the turnover of highly educated employees is growing rapidly (Blomme, Van Rheede & Tromp, 2010). The implications are that employees with higher education levels may quickly become dissatisfied if the job does not meet expectations and they may leave the job for other opportunities (Trevor, 2001). The level of education has a positive effect on the probability of changing jobs since a high education is often associated with better labour market alternatives (Royalty, 1998). Other studies, however, do not show a significant relationship.

### **2.2.6 Performance**

Job performance and turnover constructs represent two of the most significant organisational outcomes (Hochwarter, Ferris, Canty, Frink, Perrewè & Berkson, 2001), yet these combined constructs have not been widely researched. As organisational performance is correlated with economic outcomes for employees, interest in this phenomenon comes from a cost and efficiency perspective.

#### **2.2.6.1 U shape of performance**

Jackofsky (1984) described the push–pull model of performance in terms of which the worst and best performers are most likely to leave and the moderate performers are more likely to stay. This model proposes that turnover is most likely among both low performers and high performers than among average performers (Trevor et al., 1997). The authors studied the relationship between job performance and voluntary employee turnover in a study sample of 5 143 employees in a single organisation. They found support for Jackofsky's (1984) curvilinear hypothesis, as turnover was higher for low and high performers than it was for average performers.

Salamin and Hom (2005) maintain that there may be increased turnover at both ends of the performance distribution. It seems however to be somewhat stronger and more consistent at the lower end than at the higher end of the performance spectrum. They found evidence for a curvilinear relationship between performance and voluntary turnover in a large sample of primarily low-level bank employees. Over a five-year period, low performers were again the most likely to turnover. Their findings, however, suggested a J-shaped rather than a U-shaped curvilinear relationship between performance and turnover. They also found that recent bonus awards were related to both performance and turnover.

The above is consistent with the work of Trevor et al. (1997), who suggested that high performers who received low bonuses were as likely to leave as low performers. Although most performance–turnover research to date has not explicitly considered the pay-for-performance context, research does suggest that the reward system may be

an important moderator of the performance–turnover relationship. For example, Zenger (1992) reported that turnover intentions were greatest amongst moderately high and extremely low performers in two firms with strong ties between pay and extreme performance.

#### **2.2.6.2 Performance shocks**

Within the turnover-performance framework, a change in performance rating from one year to the next presents a salient external shock that forces employees to reconsider their standing with their current organisation (Becker, & Cropanzano, 2011). Downward performance shocks seem especially likely to initiate more consideration of future prospects within and outside the current employment setting. According to the unfolding model, Sturman and Trevor (2001) found that downward changes in performance were associated with higher levels of turnover. Contradictory evidence of the relationship between job performance and turnover still abounds and many researchers agree that gaps exist in the understanding thereof (Zimmerman & Darnold, 2009).

#### **2.2.7 Occupational level**

Occupational level refers to the rank of a position within an organisation (Oshagbemi, 1997). Common level distinctions are white collar versus blue collar, management, professional, administrative and semi-skilled. Howieson (2003) used survival analysis methods to track the intensity of turnover over time amongst auditors with professional training in accounting. Studies using survival analysis typically gather data using employee personnel records and/or limited self-report questionnaires so that the number of explanatory variables is limited, i.e. the main focus of this type of research was on understanding the ‘when’ of turnover rather than the ‘why’.

### **2.2.8 Marital status**

Cotton and Tuttle (1986) report a modest link between marital status and turnover, i.e. married employees show a lesser propensity to turnover compared with unmarried employees. Existing studies posit that marriage should have a negative effect on employee turnover since it is usually more costly for a family than for an individual to move to find another job (Holmlund, 1984). Frederiksen & Westergaard-Nielsen (2007) indicated that family-related elements, such as marital status and the presence of children in the household, are found to influence turnover probability significantly. Generally, one can expect differences in marital status to influence propensity to turnover. Single employees may have higher turnover than married employees as they are more mobile. One such study conducted in the health industry did not find a significant relationship between marital status and turnover (Wai Chi Tai et al., 1998).

### **2.2.9 Number of dependants**

The literature refers to 'number of dependants' as family responsibility and the term may be used interchangeable in the document. The greater the family responsibilities (the number of dependants), the less likely employees are to turnover. Furthermore, family responsibility was found to be equally important for both females and males. A change to a new organisation contains some risks to sustaining an income for a family, since if things do not work out in the new organisation, a return to the current employer is often impossible. In addition, the move to a new organisation often means a change in health insurance and pension funds. As a result, employees with greater family responsibilities have a lesser propensity to turnover (Fields et al., 2005).

### **2.2.10 Participation in training**

On-the-job training of employed workers is important because at macro level, the accumulation of human capital is the main engine of growth while at micro level, on-the-job training is a key factor for a sustained competitive advantage (Wright, Kacmar, McMahan & Deleeuw, 1995). To the extent that investment in the training of workers is beneficial to labour market performance and economic growth, it is relevant to understand any firm's main determinants of these investments.

Pajo, Coetzer and Guenole (2010) explored direct and indirect relationships between participation in formal training and development events, employee attitudes and withdrawal responses including turnover intentions and neglectful behaviour for those employed in small and medium-sized enterprises (SMEs). The results of questionnaire data obtained from 185 employee members employed in a diverse range of SMEs suggested that employees who participate in more training and development events are less likely to consider leaving their employer and less likely to engage in neglectful behaviour. However, the analysis revealed that the effects of participation in formal training and development are fully mediated by perceptions of organisational support and job satisfaction.

### **2.2.11 Promotions**

In a meta-analysis, Carson, Carson, Griffeth and Steel (1994) concluded that the overall corrected mean correlation between actual promotions and turnover was negative (corrected weighted  $r = -.45$ , 90% credibility interval =  $-.69 < p < -.21$ ). However, their analysis was based on only three studies (sample 841 employees) that examined the relationship of actual promotions to turnover. A study of 5 143 exempt employees in a petroleum products and services organisation also found a significant negative relationship between average number of promotions per year and voluntary turnover (Trevor et al., 1997).

However, after balancing out the effects of salary growth (which was highly correlated with promotions,  $r = .66$ ) in a proportional hazards analysis, Trevor et al. (1997) found that promotion rate was positively related to voluntary turnover and interpreted this finding as evidence that promotions make it easier for employees to find new jobs in the external market. Although Powell (1999) did not measure actual promotions, it was found that managers' perceptions of advancement opportunities at their current organisations were negatively related to their turnover intentions. No empirical research about gender differences in the relationship between actual recent promotions and voluntary turnover for managers could be found but the available prior research suggested that the relationship is likely to be negative for both women and men.

In contrast, Tanova (2003) states that highly developed organisations could produce lower turnover rates since promotional opportunities have a strong negative influence on departures for career-related reasons besides substantially higher wages for desired and qualified employees.

#### **2.2.12 Locations**

Limited formal research exists pertaining to turnover in the various South African provinces and the closest research found was dated and referred to as “job hopping”. Ghiselli (1974) documented the tendency of workers to engage in frequently changing jobs and termed it the “hobo syndrome”, in other words the periodic itch to move from a job in one place to some other job in some other place. This job-hopping phenomenon is attributed to labour shortage, i.e. labour demand exceeds the supply in a scarce skill environment. In South Africa, the formal sector increased by 56 000 jobs of which 37 000 were in financial services (Statistics South Africa, 2011). This 56 000 represent the alternative job opportunities available for skilled employees. This is explained in combination with economic growth. As the economy slows down, workers have reduced alternative employment opportunities, which partly explain the reduced turnover. The availability of job alternatives is generally regarded as a prerequisite to job mobility in most traditional models of turnover (Griffeth et al., 2000). Notwithstanding the recession, South Africa also has a serious job scarcity problem due to the slow economic growth.

#### **2.2.13 Business unit**

There is a solid body of research suggesting that the organisational culture, broadly defined, can have a significant impact on the job satisfaction of employees and therefore their propensity to stay or leave (Sheridan, 1992; Tett & Meyer, 1993). Not surprisingly, if people like where they work, feel valued, and have a sense of shared purpose with other employees, they will be less likely to want to change jobs. The processes that shape workplace culture include management behaviour and attitudes, policies and practices relating to discipline, communication, training, and the provision of opportunities for job variety and career advancement.



The level of workforce stability can also have an impact. When personnel are changing rapidly, it is much more difficult to build up organisational commitment and a sense of shared purpose. In this regard, high turnover may not only be a consequence of a poor organisational culture, but may also play a significant role in perpetuating it (Hom & Kinicki, 2001).

### **2.3 Summary**

Employee turnover is an important research topic in the fields of organisational behaviour, human resources management and labour economics. Consequently, there is an increasing need to understand the major critical variables affecting turnover. The relationship between demographic variables and voluntary turnover is a topic of interest for a number of researchers. Although a cursory examination of this literature suggests that consensus exists regarding the nature of this relationship, a more detailed analysis reveals significant disagreement. This dissensus leads to different conclusions and limits theoretical development within this research space

The turnover literature has been led by research on how work attitudes (e.g. commitment and job satisfaction) influence turnover (Mossholder, Setton & Henagan, 2005). The contribution to literature has been significant but at the expense of less traditional turnover variables (e.g. demographics). The present study made an attempt to determine whether demographic variables can influence turnover. The preceding literature suggested that a number of important factors are emerging that influence employee turnover. Several consistent findings emerged from the data. The variables examined by Cotton and Tuttle (1986) which have an impact on turnover include age, years of service, gender, marital status, education, number of dependants, intelligence, behavioural intentions and race.

## **CHAPTER THREE**

### **METHOD**

#### **3.1 Introduction**

This chapter provides an overview of the methods applied in this study. Secondary data were utilised for this study. The data were excerpted from an existing human resources database at a large insurance organisation. The general design is given in detail along with the secondary data analysis process. The present study was designed to extend understanding of the impact of demographic variables on employee turnover by examining actual voluntary turnover amongst a large sample using exploratory data analysis.

#### **3.2 Research design**

##### **3.2.1 Research site**

Secondary data were obtained from personnel records of a large insurance organisation that were stored electronically with its headquarters in Cape Town and with approximately 60 branches throughout South Africa.

##### **3.2.2 Sample characteristics**

A total of 2 592 employees from two countries are represented in the sample. The ratio of male to female was 42:58. Table 1 presents selected characteristics of the population. Descriptive information on the sample is presented in Chapter 4; thus, only a brief summary of these data is presented here. The sample range in age from 18 years to + 60 years of age. The sample includes 1 097 males and 1 495 females. Just over half of the sample are White, with the remainder split between coloured  $n = 648$ , Black  $n = 409$  and Indian  $n = 187$ .

Table 1

*Characteristics of the study sample*

Criteria	Description
Gender	Male and female
Race	Black, white, coloured and Indian
Age	18+
Location	South Africa and Namibia

### 3.2.3 Variables

#### 3.2.3.1 Data

The secondary data reported in this research were collected from organisation's employees located in the human resources information system. Company records included an observation of the database on August 1 of years 2008–2011. The organisation provided 22 fields for each individual employee record of which only 14 variables were selected for analysis.

#### 3.2.3.2 Dependent variable

Employee turnover is the variable of primary interest. The ultimate aim was to explain the variation of the dependent variable, or to predict it. It is a variable whose values vary and which is dependent on other factors. In the current study, the focus was on understanding what influences employee turnover, that which makes employee turnover the dependent variable. Turnover is measured as a dichotomous variable, where 1 represents those who left the organisation and 0 represents all others.

#### 3.2.3.3 Independent variables

The independent variables are those that influence the dependent variable and bring changes in its values. In the current study, the variables are grouped as follows:

1. Demographic data (age, gender, race, marital status, number of dependants, location, years of service and language)

2. Organisational data (the employee's place in the organisational hierarchy and includes job grade, occupational level, business unit/cost centre)
3. Job performance data (promotions and participation in training)

For the purposes of the current study, the permanent employee was deemed the employee. The input data came from a record for each employee. The input data contain variables (independent) with the demographic values for each employee. The dependent variable was an indicator of whether the employee had voluntarily terminated or not. Each employee (event, case, observation) was assigned an identification number and entered into a data file. This assisted in the event that some employees may have had bad data on a particular variable. Using the identification numbers, it was then possible to go back to the raw data in the HR system in order to correct data in the event of a data entry error.

### **3.3 Ethics and confidentiality**

It would have been impossible to gain consent from all participants in the study. Therefore the custodian of organisation employee data, i.e. the Head: HR was approached and permission requested to gain access to the data. The organisation invests much in its employees by way of recruitment, induction, training and development, maintaining and retaining them within the organisation. It is evident that there are significant costs involved in hiring, training and retaining new employees. Therefore, permission to conduct this research was granted with the following confidentiality provisions:

1. the name of the organisation would not be indicated, only the industry;
2. only two people were granted access to the raw data, i.e. the researcher and the internal statistical associate;
3. the data would not be given to parties outside the organisation, e.g. the university's statistics department;
4. access to the HR information system was given for a specified period of time and terminated thereafter;
5. the organisation would have veto rights over whether the research could be published; and

6. some employee information was not made available for the research, i.e. current salary and salary increase.

To address the issue of anonymity (concealing the identities of participants) in all documents resulting from the research, the following steps were taken:

1. data were extracted from the HR information system; and
2. in the MS Excel format, the name and surname were removed from the data set and each employee record was given a computer-generated identification number.

The process of generating rules through data mining becomes an ethical issue when the results are used in decision-making processes that effect people. The results of this study will not be used for the selection of employees and only as a risk management tool for existing employees.

### **3.4 Data analysis process**

The technique called data mining, a branch of applied informatics, was utilised for this study. Two high-level goals of data mining were identified, i.e. description and prediction (Wang, Wang, Zhang & Cao, 2011). Wang et al. (2011) define data mining as the process of secondary analysis of large databases aimed at finding unique relationships that are of interest to researchers. Data mining has the added benefit of allowing researchers to examine large quantities of structured or unstructured data in an endeavour to find patterns and rules (Linoff, 2004). These patterns are then analysed in order to yield knowledge. The desired outcome of data mining activities is to discover knowledge that is not explicit in the data and to put that knowledge to use. During the process of exploratory data analysis, the researcher goes back and forth to add variables to or take variables out of the model. A standard statistical software package (SAS) was used for all data analysis. The steps in the research process are described below.

### 3.4.1 Defining the problem

In the model, the independent variables are expressed as a function of the dependent variable. This allows the value of the dependent variable to be predicted from given values of the independent variables (Shaw, Subramaniam, Tan & Welge, 2001). The form/equation of the model being fitted is:

$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_m x_m$$

Equation 1

The equation indicates the structure of the model as well as the relationship between the odds and probability of resignation, where  $p$  is the probability of the event,  $x$  is the covariate (independent variable) and beta ( $\beta$ ) the coefficient for the different covariates. Beta coefficients are the estimates of the linear relationship between the dependent variable and the independent variables. If we look at the left-hand side of the equation (Equation 1), the probability of the event of interest occurring is not being explicitly modelled.

The odds of the event occurring are being modelled. In other words, the model predicts the probability of the event occurring ( $p$ ), relative to it not occurring ( $1-p$ ). However, the concept of dealing with odds is not intuitive and not practical for implementation purposes. Fortunately, the equation can be transformed into a more suitable form, namely:

$$p = \frac{e^{\beta_0 + \beta_1 x_1 + \beta_2 x_2}}{(1 + e^{\beta_0 + \beta_1 x_1 + \beta_2 x_2})}$$

...Equation 2

On the left-hand side of the above equation, we notice that the probability of the event of interest is being explicitly calculated. The result is more intuitive and more practical to explain. Due to the two forms of the model (both being mathematically equivalent) the coefficients can be interpreted in two ways. Fortunately, both are related and it is therefore only necessary to use one.

### **3.4.2 Collecting and preparing the data**

Data are scattered across the organisation and stored in different formats, and it may contain inconsistencies such as incorrect or missing entries. Data cleaning is not just about removing bad data, but also about finding hidden correlations in the data, identifying sources of data that are the most accurate and determining which columns are the most appropriate for use in analysis. Incomplete data, wrong data and inputs that appear separate, but which are in fact strongly correlated (e.g. occupational level and years of service), can influence the results of the model in ways not expected. Therefore, before one starts to build mining models, you should identify these problems and determine how you will fix them. To achieve this end, the following steps were taken:

#### **3.4.2.1 Data collection**

The secondary data source for building the predictive model was the organisation's human resources (HR) management system. The HR management system contained data that captured several aspects of an individual's personal and work history. All data for all employees, permanently employed between 2008 and 2011, were included. For purposes of the current research, direct access was given to the database where the researcher could extract the data herself.

#### **3.4.2.2 Data preparation**

The preferred structure for the predictive turnover equation was to have a record of data for each employee. The data set consisted of rows and columns in which data values were stored (see Table 2). The rows in a data set were termed observations and the columns were the variables. Variables contained the data values for all of the items in an observation (see Table 2). Once the data had been collected, it was necessary to prepare for statistical treatment. Preparation of data takes a long time and this step was crucial in determining the accuracy of the eventual model.

Table 2

*Excerpt of data set*

ID NUMBER	BIRTHDATE	GENDER	LANGUAGE	MARITAL	RACE	
001830	1966/12/26	Female	Afrikaans	Single	White	
006271	1972/04/03	Female	Afrikaans	Married	White	
007103	1968/03/12	Female	Afrikaans	Single	Coloured	Observation
014819	1966/05/06	Female	Afrikaans	Married	White	
018091	1960/06/20	Female	Afrikaans	Married	White	
028879	1961/02/03	Female	Afrikaans	Married	White	
034771	1967/03/02	Female	English	Divorced	White	Variable
034780	1962/08/04	Female	Afrikaans	Married	White	
035824	1974/03/01	Female	Afrikaans	Married	White	
035913	1974/05/31	Female	English	Married	Indian	
036154	1968/01/21	Female	Afrikaans	Married	White	
039390	1968/12/18	Female	English	Single	White	
050050	1967/12/03	Female	Afrikaans	Married	White	
050718	1963/05/07	Female	English	Divorced	White	
053431	1957/10/03	Female	English	Married	.	missing value
data value						
						data value

### 3.4.2.3 Data cleaning and screening

Prior to any statistical analysis, data cleaning and screening must be performed to identify miscoded, missing or messy data and to improve the performance of statistical methods (Odom & Henson, 2002). Clean data is a critical precondition for analysis and in the current research, this process was performed manually. When suspicious data, e.g. female that is indicated as male, items arose this process enables the researcher to go back and check against the original data source.

### 3.4.2.4 Data coding

Once the data had been cleaned, it was coded (SAS Institute Inc., 2001). Data coding is a methodical way by which to reduce extensive data sets to smaller analysable units through the design of categories and concepts resulting from the data (Ruscio & Roche, 2011). Cleaning changes the working data into the required form and is a further step in data preparation. Coding prepared data in a format that the SAS program could effectively do the analysis (SAS Institute Inc., 2001).



### **3.5 Exploring the data**

Exploratory data analysis was selected in order to summarise the relationships of the independent variables in order to eliminate those that did not relate to voluntary employee turnover. One common purpose of using exploratory data analysis (EDA) is to summarise relationships in the form of a simple representation that can be used in subsequent analysis (Ruscio & Roche, 2011).

### **3.6 Model and variable selection**

This stage involved considering various models and choosing the best one based on predictive performance (i.e. explaining the variability in question and producing stable results across samples). This may sound like a simple operation, but in fact, it sometimes involves a very elaborate process. There are a variety of techniques developed to achieve this goal – some of which are based on so-called ‘competitive evaluation of models’, which applies different models to the same data set and then compare their performance to choose the best.

The purpose of variable selection is to select the most revealing variables for the model that predict the target variable from a combination of potential input variables. Selecting the right combination of input variables is one of the most important steps in a well-designed statistical model (Allen, 1974).

#### **3.6.1 Variable selection method**

Stepwise regression consists of three procedures: forward selection, forward stepwise regression and backward elimination (Ye, 1998). Forward stepwise regression is a popular procedure and was chosen for the present study. The forward selection technique begins with no variables in the model. Demographic variables are subsequently added to the model one at a time. At each step, any variable that is not already in the model is tested for inclusion in the model. The most significant of these variables is added to the model, as long as its p-value is below the pre-set level. It is customary to set this value above the conventional .05 level at say .10 or .15, because of the exploratory nature of this method (Bruce, 1995).

The Akaike information criterion (AIC) and Schwartz coefficient (SC) were also used to test how much value a variable added to a model and if its inclusion was warranted.

### 3.7 Validating the models

Separating data into training and testing sets is an important part of evaluating data mining models (Saradhi & Palshikar, 2011). Typically, when one separates a data set into a training set and testing set, most of the data is used for training, and a smaller portion of the data is used for testing. By using similar data for training and testing, one can minimise the effects of data discrepancies and better understand the characteristics of the model. A training set is a set of data used in various areas of information science to discover potentially predictive relationships

Table 3

*Training and testing data sets*

	2008		2010	
	Training			
				Testing data

Training involves passing a certain percentage of the cases through the system in order to ‘teach’ the system to recognise the patterns present in the data (Quinn, Rycraft & Schoech, 2002). In the present study, the training data were 80% of data set – all information between August 2008 and August 2010 (see Table 3). The test set is a set of data (20%) that is independent of the training data, but that follows the same probability distribution.

### 3.8 Deploying and updating the models

The last step in the data mining process was to deploy the best performing models to a production environment. The normal practice, while applying data mining techniques, is to divide the data into training and testing data sets (Table 3). The models are trained using the training data set and then the model thus developed is tested using the testing data set. The main objective of such separation of training and testing data sets is to make sure that the models developed will not be specific to the special patterns in a particular data set.

### **3.9 Interpretation**

In any research study, statistical data on its own would not be enough. To make sense, the quantitative numbers must be interpreted. While numbers are powerful because of the complex mathematical procedures they permit, they mean very little unless they are based on important theories (Odom & Henson, 2002). In other words, social or scientific research based on quantitative data without qualitative data would not connect and interact well with the world. Therefore, data obtained through the instruments selected for a research study must be grouped, analysed and interpreted in a generally or specifically acceptable manner, making the findings revealed by the data and the recommendations made, based on the findings as applicable and as relevant possible to the particular research question (Kane-Sellers, 2008). The results and interpretation of these are presented in Chapter 4 and discussed in Chapter 5.

Creating a predictive model is a dynamic and iterative process. It could be observed from this chapter that conceiving a research design involves planning and structuring the investigation to obtain answers to research questions. Despite the fact that the research process followed was depicted and discussed in this chapter as a systematic linear process, the researcher was mindful of the challenges faced in executing this study.

## **CHAPTER FOUR**

### **RESULTS**

#### **4.1 Introduction**

This dissertation reports on a logistic regression in which demographic variables of 2 592 employees of a large insurance company were used to predict voluntary turnover. The general insurer has headquarters in South Africa with a market share nearing 23%, and 60+ offices located in both South Africa and Namibia. This chapter presents the results of the analysis. The first section describes the basic information derived from the analysis through descriptive statistics. The second section presents the actual results.

#### **4.2 Descriptive statistics**

The data source for building the predictive model was the HR management system. The system contained data that captured multiple aspects of the employees' life cycle. The study looked at all employees who were permanently employed with the organisation on 1 June 2008. Their demographic and occupational characteristics were recorded and all the terminations that occurred between 1 June 2008 and 31 May 2010 were examined. The reason for termination of employment was then analysed so that only those who left voluntarily remained. Employees who had joined the organisation during the observational period were not included in the study. This resulted in 2 592 employees being studied (see Table 4 on next page).

##### **4.2.1 Data set**

To test the model, it needed to be fitted to an independent data set. Since the interest is in voluntary resignation over the period of a year, the latest data available (2011) were used for testing. Any prior data was used for model building. Due to system and HR practice changes in 2007, data recorded before this period was considered unreliable and incomplete. Hence, 2008 was deemed a suitable starting point as all observations thereafter had a sufficient amount of demographic information and information about resignation from the company.

The study utilised secondary data collected on employees who were permanently employed with the organisation as of 2008 and who had voluntarily left the organisation between 2008 and 2011. This group represented the sample.

Employees who had left the organisation on an involuntary basis were excluded from the study. Table 4 shows the distribution of 2 592 employees by current age, gender, race, age, language and marital status. This sample information is illustrated in a frequency distribution format.

Table 4

*Demographic frequency of the sample*

Variable	Value	Frequency Count	Percent of total Frequency
Gender	Male	1097	42.3%
	Female	1495	57.7%
Race	White	1348	52.0%
	Coloured	648	25.0%
	Black	409	15.8%
	Indian	187	7.2%
Age band	20-30	386	14.9%
	31 -40	871	33.6%
	41-50	785	30.3%
	51-60	480	18.5%
	60+	70	2.7%
Language	Afrikaans	1348	52.0%
	English	922	35.6%
	Damara *	1	0.0%
	Black language	313	12.1%
Marital status	Married	1481	57.1%
	Single	821	31.7%
	Divorced	223	8.6%
	Common law	18	0.7%
	Widowed	48	1.9%

\*Refers to a language spoken in Namibia

From Table 4, it can be seen that the majority of the employees (n=871 or 34%) were in the age group 40–50 years, while 31% (n=785) were in the age group 40–50 years. A total of 480 employees (19%) fell in the age category 50–60 years, and a further 15% (n=386) of the employees were in the age group under 30 years old. The numbers indicated a mature workforce with the under-30s representing 15% of the sample.

Of the 2 592 employees, 30% were white females, followed by 22% white males, 15% coloured females, 10% coloured males and 9% black females.

The smaller percentages of employees were black males (7%), followed by Indian females (4%) and Indian males (3%). The ratio of white: black (coloured, Indian, black) was 52:48, and in an organisation where transformation is one of the strategic drivers, the issue of retention (especially amongst black) and skills scarcity (highly skilled industry) becomes critical.

#### **4.2.2 Excluded variables**

There were reasons for the exclusion of some variables. The accuracy of the organisation's employee records with regard to education (tuition reimbursement and additional education received after employee service date) were insufficient and this resulted in the decision to disregard education as a variable in the study. Another variable excluded was salary information. Regrettably, the organisation did not allow access to the information.

### **4.3 Exploring the data**

As the primary focus of the study was on exploration, the next section reports on the inter-correlations between dependent and explanatory variables. The first step of the analysis involved running a correlation matrix of all variables and then examining it for expected (and unexpected) significant relations. Data is grouped into the following categories: demographic data, organisational data and performance data.

## 4.4 Demographic data

### 4.4.1 Age

The differences in turnover attributable to age were clear (see Figure 1). Employee age was categorised: 20–25, 26–30, 31–35, 36–40, 41–45, 46–50, 51–55, 56–60 and 60 and over. The largest group of employee turnover was in the 20–30 group (33%), followed by 31–40 (32%).

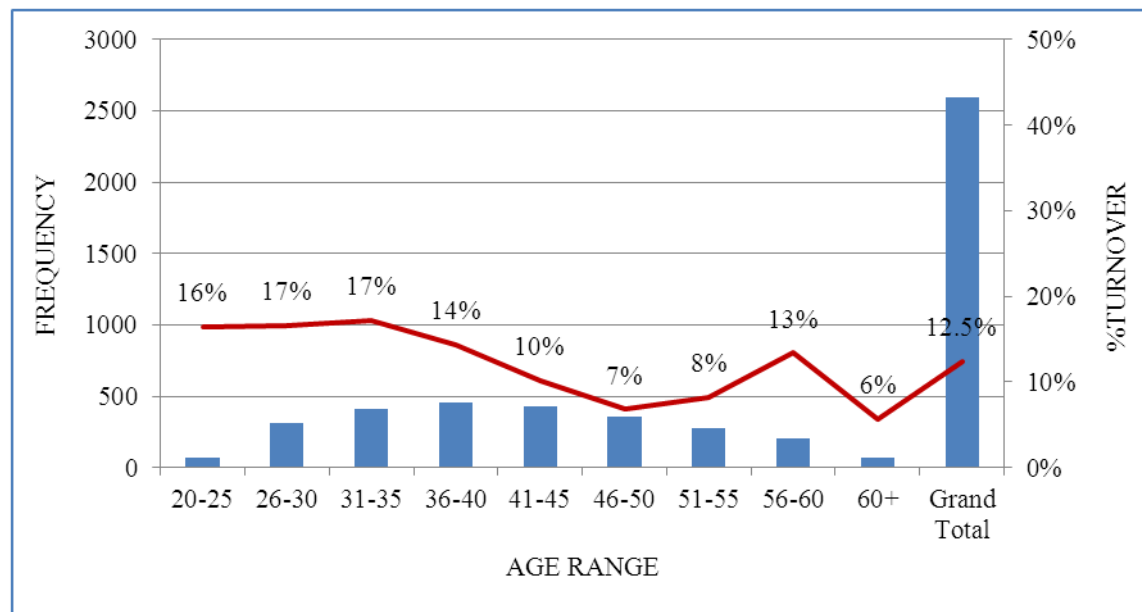


Figure 1 Age and voluntary turnover

There were descriptive differences between the study group in turnover. Between 14% and 17% of employees in the 4 youngest age groups had left the organisation for another job, a figure that decreases to 7% for the 46–50 age group and to 6% for those over age 60, i.e. turnover propensity decreases with age.

### 4.4.2 Gender

In the category of gender, 1 495 employees were females, representing 57.7% of the study group, and 1 097 employees were males, representing 42.3%. These are presented in Figure 2 below.

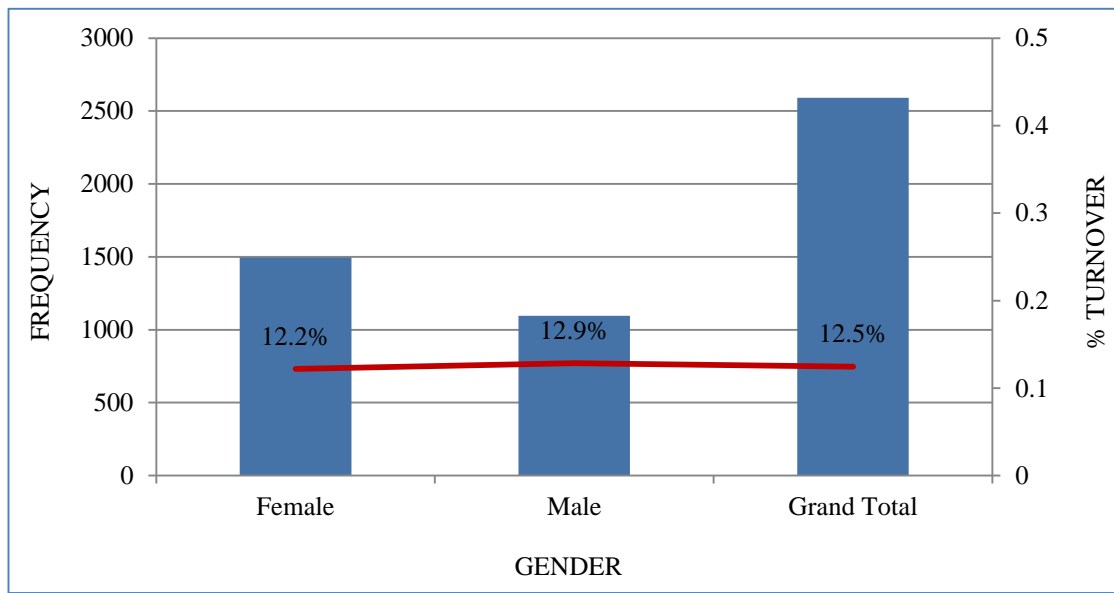


Figure 2 Gender and voluntary turnover

The turnover rates for male and female were very similar (see Figure 2). Gender as a correlate of turnover has been inconclusive as a factor in understanding the development of a turnover decision (Weisberg & Kirschenbaum, 1993).

#### 4.4.3 Race

The sample is divided in terms of race into the following groups: 409 black, which constitutes 15.8%; 187 Indians, which is 7.2%; 648 coloureds, which is 25% and 1 348 whites, which is 52%. The two biggest race groups in the study were whites followed by coloureds. These are represented in Table 3 below.



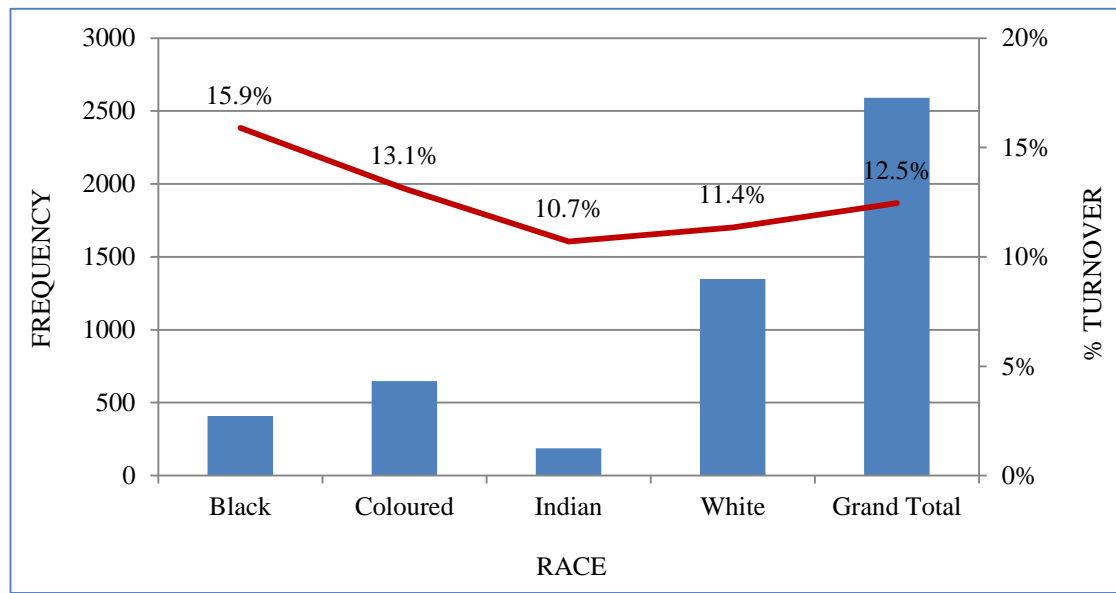


Figure 3 Race and voluntary turnover

Figure 3 indicates that race was potentially a significant variable. The results indicate:

- Voluntary turnover for black employees was the highest at 15.9%. This percentage was higher than the organisation's average turnover rate.
- Coloured employees had a slightly higher turnover rate at 13.1%, than Indians and Whites, were and also higher than the organisation's average.
- Voluntary turnover for white and Indian employees were approximately the same at 11.4% and 10.7%. This was an interesting fact as white represents the largest percentage of the sample and Indians the smallest.

#### 4.4.4 Race and gender

Combining race and gender (Figure 4), appeared significant within particular race groups.

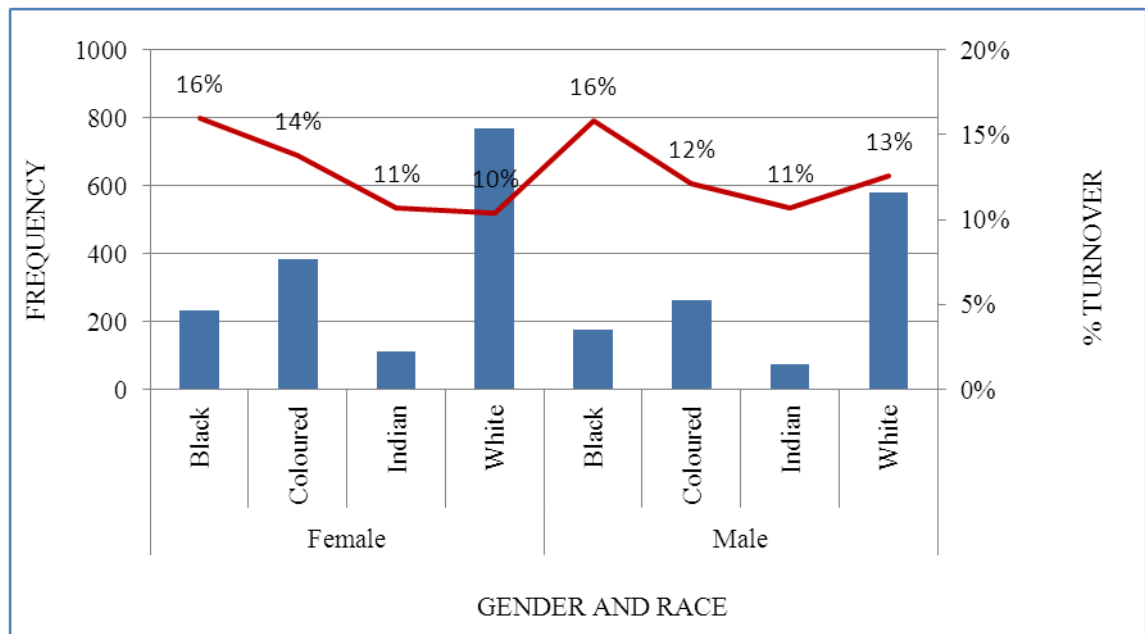


Figure 4 Gender-race and voluntary turnover

Figure 4 indicates:

- Voluntary turnover for black male and females constituted 16% and was significantly higher than the overall turnover for the organisation (12.5%).
- Other significant groups were coloured females, white males and coloured males.

#### 4.4.5 Language

The challenge in the business world is to manage employees from diverse backgrounds speaking different languages. The sample was divided by language into the following major language groups (see figure 5):

- 1 348 Afrikaans (52%)
- 922 English (35.6%)
- 1 Damara (0%)
- 313 black languages (12.1%).

South Africa has 11 official languages, and while English is the preferred language for business, it ranked second (35.6%) in the sample while Afrikaans (52%) emerged as the dominant language.

The black languages made up the remaining percentage with Damara being a language spoken in Namibia.

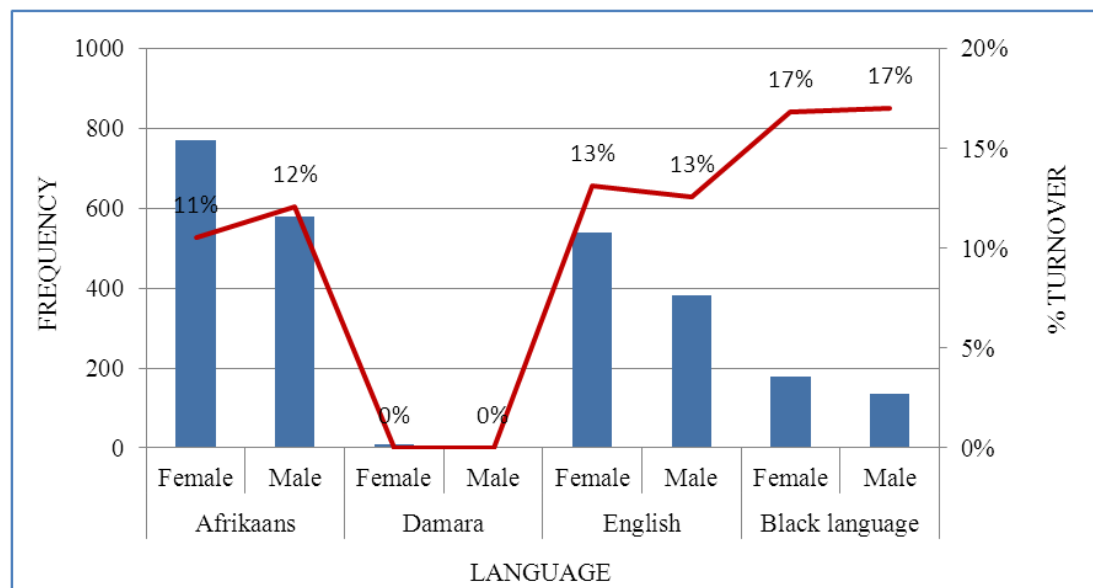


Figure 5 Language and voluntary turnover

The results of this study indicated that the employees speaking a black language (Figure 5) had a higher correlation with turnover. This is in alignment with the race–turnover results.

#### 4.4.6 Marital status

Figure 6 indicates that of the 2 592 employees, 1 481 were married and rest had the following statuses (as classified in the organisation’s HR system):

- Single (31.7%)
- Divorced (8.6%)
- Widowed (1.9%)
- Common law (0.7%)

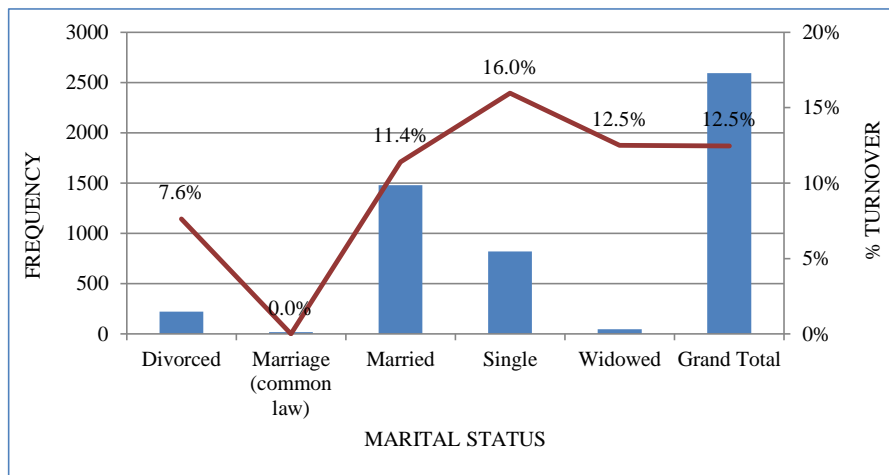


Figure 6 Marital status and voluntary turnover

The results (see Figure 6) indicate that unmarried people had a higher frequency than employees with other marital status. The highest turnover percentages were single employees (16%) followed by widowed employees (12.5%).

#### 4.4.7 Marital status and race

Amongst those who were single (see Figure 7), Indian people (23.1%) had the highest turnover rate.

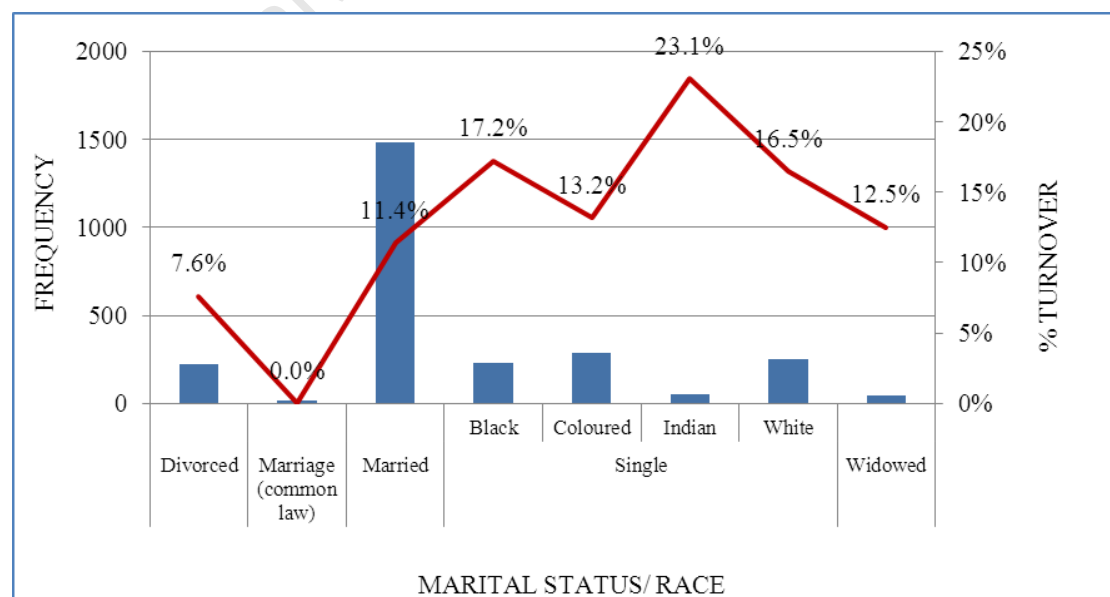


Figure 7 Marital status-race and voluntary turnover

## 4.5 Organisational data

The next section of correlations reviews organisational data against turnover.

### 4.5.1 Years of service

Years of service was categorised in number of continuous years worked for the current organisation.

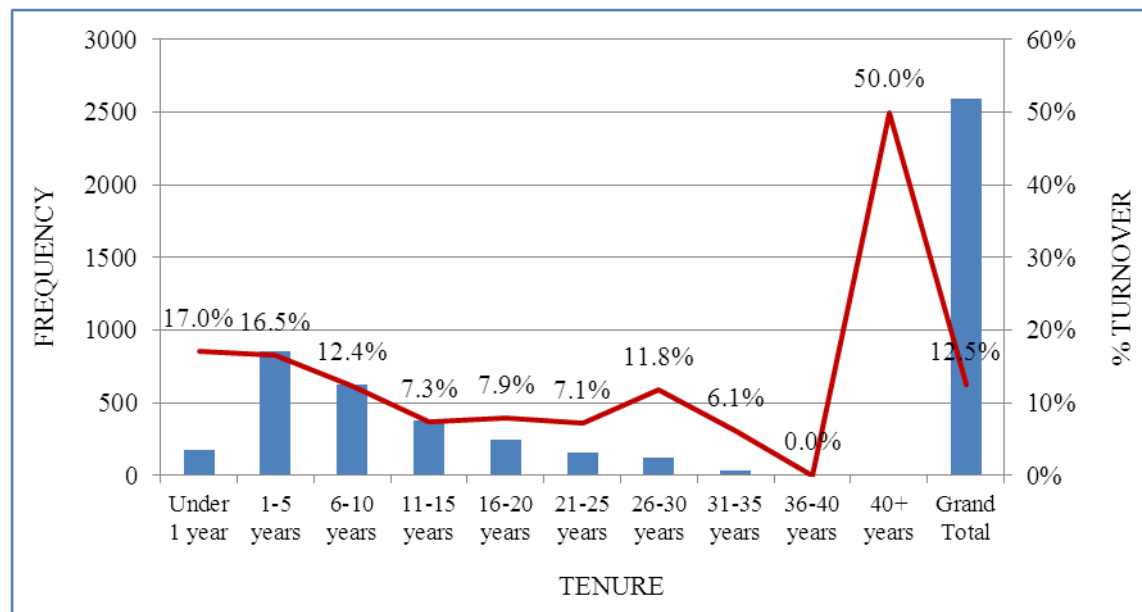


Figure 8 Years of service and voluntary turnover

The resulting frequencies were 17%, under a year, 16.5% = 1–5 years, 12.4% = 6–10 years, 7.3% = 11–15 years, 7.9% = 16–20 years, and 32.9%, = more than 20 years. The results (Figure 8) indicate that, while the likelihood of leaving increased with the length of continuous service, the likelihood of moving out of the organisation was highest for those with 0–5 years of service.

### 4.5.2 Occupational level

Occupational level information indicates that 30% of the sample was senior management (including executives) and the other 70% ranged from junior management to unskilled.

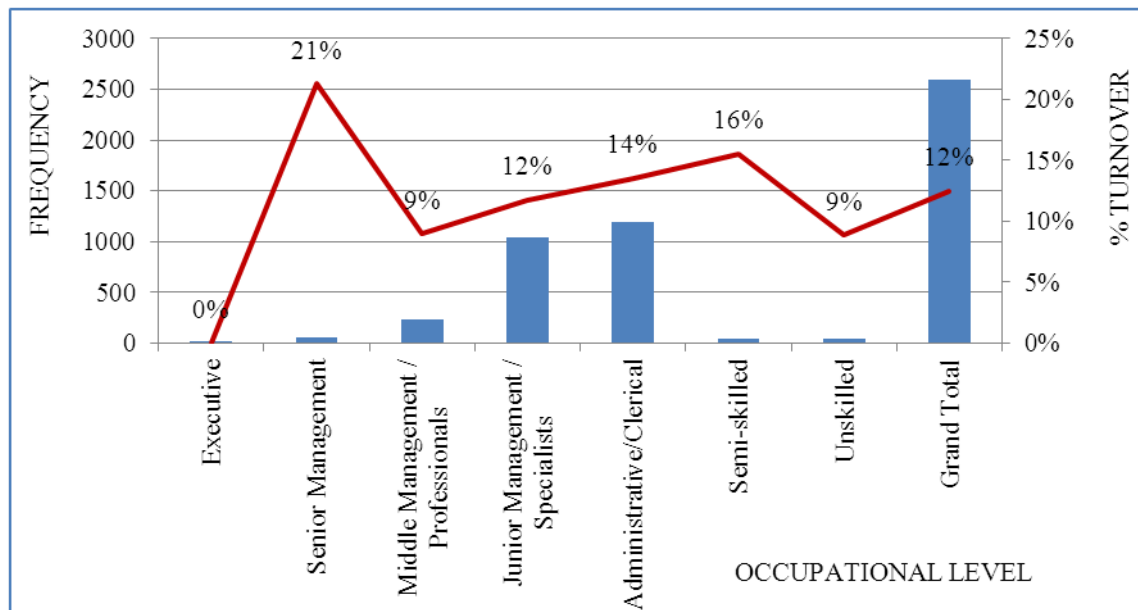


Figure 9 Occupational level and voluntary turnover

Figure 9 shows that occupational level could be a potentially significant variable. The data indicated that the turnover rate for senior management and semi-skilled employees was approximately the same.

#### 4.5.3 Geographic location

Offices in North-West, the Northern Cape, Gauteng and Namibia had the highest turnover rates. The high turnover rates in North-West, the Northern Cape and Namibia could be due to the smaller number of employees in these areas and the nature of their occupation.

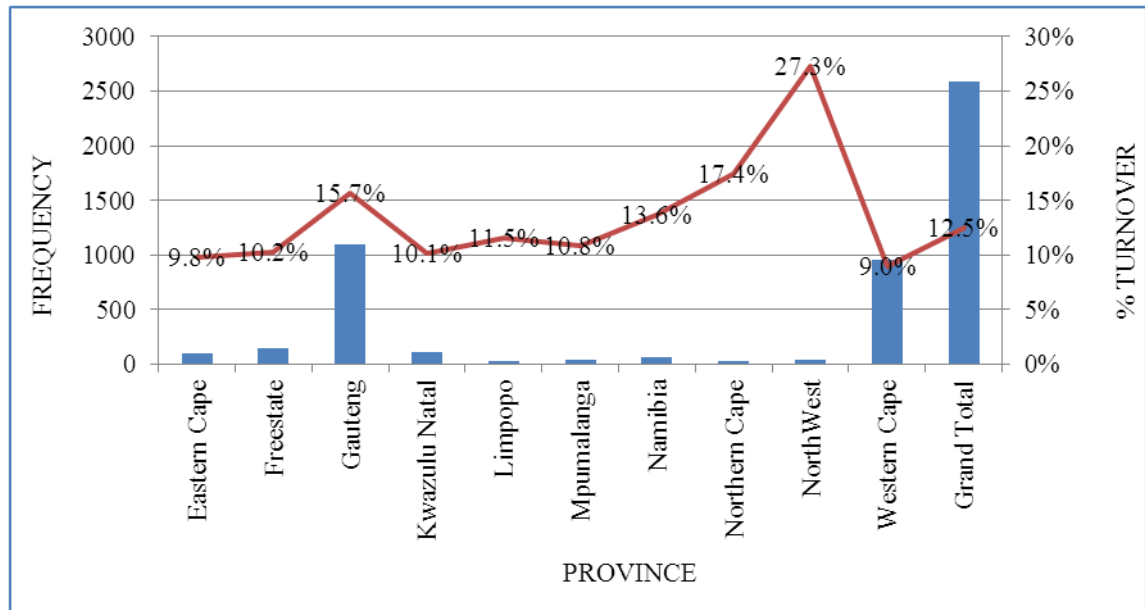


Figure 10 Location and voluntary turnover

However, the high turnover rate in Gauteng (given the fact that most of the organisations' employees are employed in Gauteng) could be indicative of a larger underlying trend, namely that employee turnover is naturally higher in Gauteng than compared to the rest of South Africa.

#### 4.5.4 Job grade

Job grades are used by organisations to help managers manage the compensation of new employees and establish appropriate pay increases for existing employees while maintaining turnover among the jobs in the company.

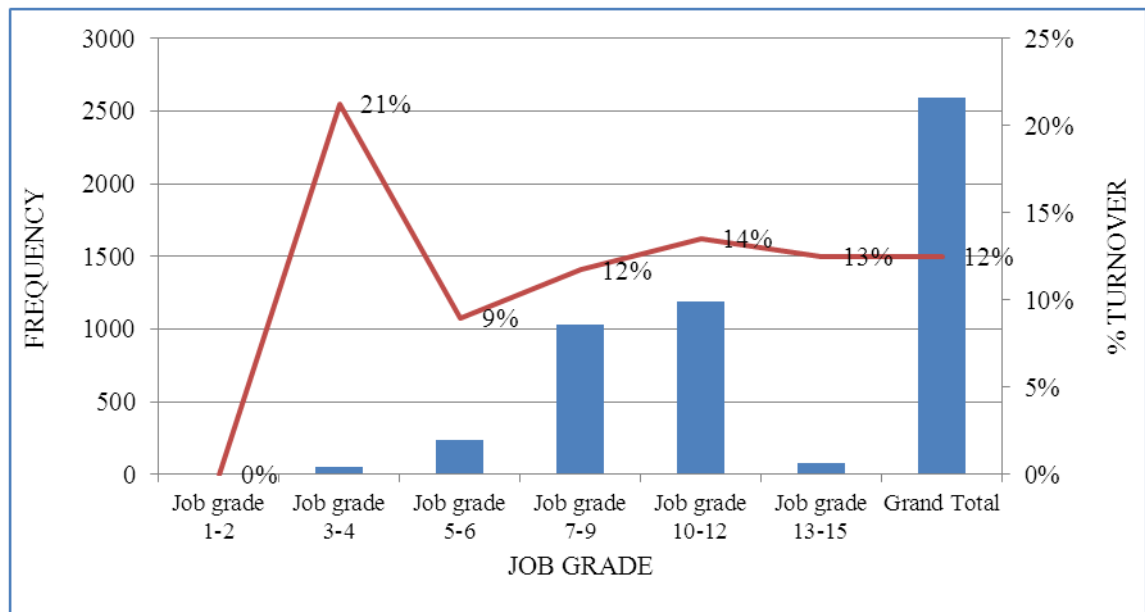


Figure 11 Job grade and voluntary turnover

Figure 11 illustrates the job grade–turnover relationship. Years of service and job grades are closely related and a similar turnover trend is exhibited w. Statistical significance was present at job grades 3–4 (21%), job grades 10–12 (14%), job grades 13–15 (13%) and job grades 7–9 (12%).

#### 4.5.5 Business unit

Figure 12 indicates that the statistical significant relations between business unit and turnover rate exists at Broker distribution (13.3%), Corporate services (12.2%), Claims services (12.1%), Specialist business (17.5%), Market development (12.5%), People, and Brand (17.5%).



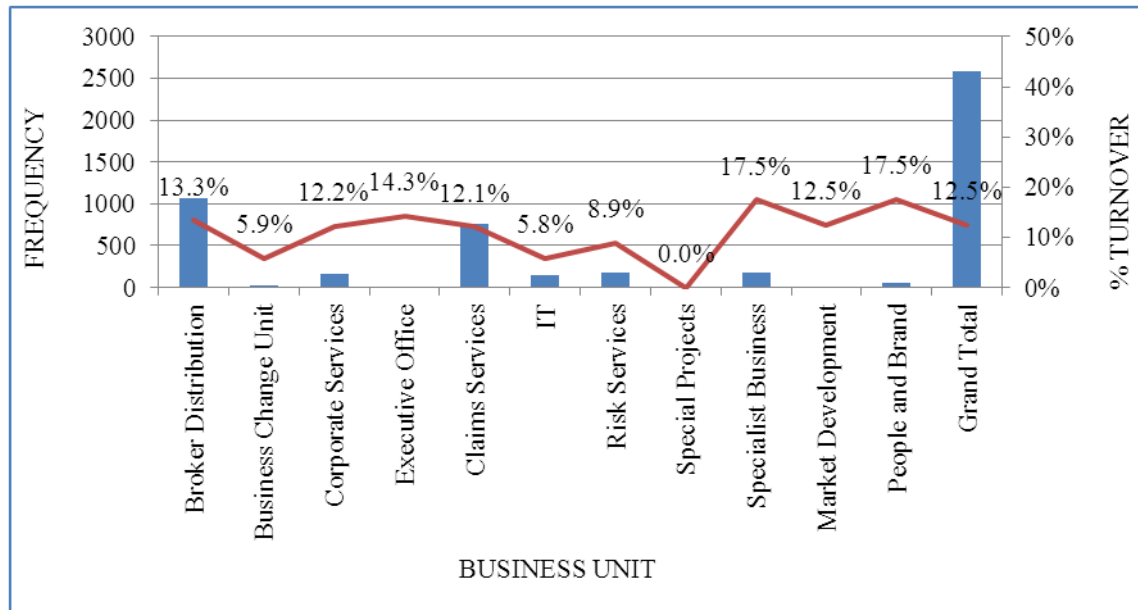


Figure 12 Business unit and voluntary turnover

#### 4.6 Performance data

For the data set, the mean is the sum of the values divided by the number of values.

##### 4.6.1 Performance scores

Table 5 shows a set of descriptive statistics of the performance score for those who left and those who did not leave voluntarily.

Table 5

*Performance and voluntary turnover*

		Mean	1st quartile	Median	3rd quartile
Performance score	1	106.78	100.25	107.15	113.4
	0	105.13	100	106.15	112.24

The performance score was recorded and modelled as a continuous variable. Dichotomisation of the variable was unnecessary as it would have resulted in loss of information and decreased model performance. The modelling software (SAS 9.2) was also capable of handling the variable, thus no transformation was necessary.

In Table 5, employees who had left the organisation are coded as a 1 and those who had stayed are coded as 0. The performance scores for those who did not leave were consistently lower than the scores for employees who did leave. However, the difference does not appear to be significant. Performance score could be a useful variable in the final model but its effect is likely to be marginal.

#### 4.6.2 Promotions

A promotion is defined as a move to the next hierarchical level (Lyness & Judiesch, 2001).

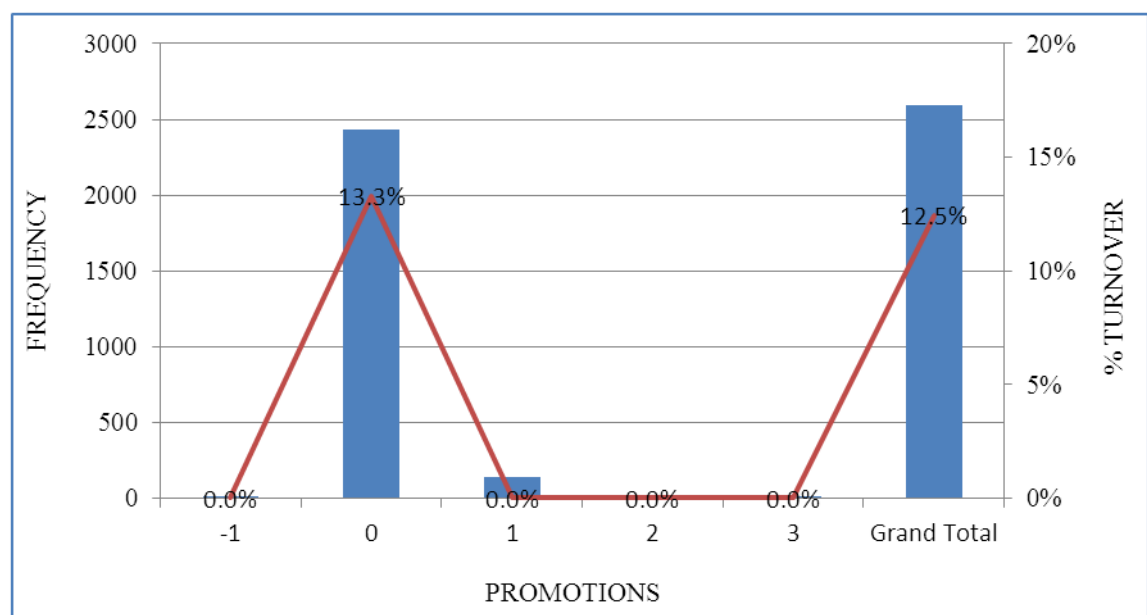


Figure 13 Promotions and voluntary turnover

Figure 13 indicates that the turnover rate was highest amongst employees who had not been promoted, while no voluntary resignations were found amongst people who had been promoted one, two or three levels.

## 4.7 Model selection

Since turnover is a dichotomous variable, making use of a logistic regression model was a good place to start this study (Quinn, Rycraft, & Schoech, 2002). The forward selection technique began with no variables in the model. Explanatory variables were subsequently added to the model one at a time. At each step, each variable that was not already in the model was tested for inclusion. The likelihood ratio test was used to test if adding a variable was of significant value. The p-values of the test were quoted. Automated model building software packages could not be used because some variables were collinear. Collinear variables, which are not eligible for inclusion in the model, have crosses in place of their statistics. The most significant of these variables were added to the model. The AIC and SC were used to test how much value a variable added to the model and if its inclusion was warranted.

Table 6

*Variable selection with Akaike information criterion (AIC)*

		Step 1	
		P-value	AIC
~	~	<.0001	1571
Occupation level	+Occupation level	0.2235	1573
Job grade	+Job grade	0.2202	1573
Performance score	+Performance score	0.007	1565
Years' service	+Years' service	0.0002	1557
Race	+Race	0.0347	1568
Province	+Province	0.0008	1553
Age band	+Age band	0.0002	1544
Marital status	+Marital status	0.0055	1565
Business Unit	+Business Unit	0.1057	1569
Cost-centre band	+Cost-centre band	<.0001	1285
No of dependants	+No of dependants	0.1134	1570

~ Null model (models the response without any covariates included)

Step 1 of the model selection process showed that the cost-centre band was clearly the most powerful variable. The corresponding small p-value and AIC were much smaller than those calculated for the other variables.

Table 7

*Variable selection with Schwarz criterion (SC)*

		Step 2		Step 3	
		P-value	SC	P-value	SC
~	~	-	1330	-	1321
Occupational level	+Occupational level	0.5121	1365	0.4332	1356
Job grade	+Job grade	0.9712	1331	0.4304	1322
Performance score	+Performance score	0.0323	1324	0.0592	1316
Years' service	+Years' service	0.0091	1321		
Race	+Race	0.6579	1342	0.6537	1333
Province	+Province	0.9297	1381	0.9656	1373
Age band	+Age band	0.007	1340		
Marital status	+Marital status	0.0874	1339	0.3281	1333
Business unit	+Business Unit				
Cost-centre band	+Cost-centre band				
No of dependants	+No of dependants	0.0978	1338	0.1184	1330

~ Null model

In step 2, the business unit variable could not be fitted to the model because cost centre had already been included and the two are collinear. This iteration process showed that the number of years of service was the most powerful variable despite the fact that it had the second lowest p-value. The SC calculated for the inclusion of years of service was the smallest and so warranted the inclusion of this variable rather than that of age.

In step 3, the age variable could not be fitted to the model because years of service had already been included and the two are highly correlated. This iteration process showed that the performance score variable was the most powerful variable. The corresponding small p-value and SC were much smaller than those calculated for the other variables.

In step 4, the inclusion of an interaction term was tested (refer to Table 8).

Table 8

*Variable interaction Schwarz criterion (SC)*

	Step 4	
	P-value	SC
Number of dependants* Years' service	0.087	1310

While several variable interactions were tested, the most powerful turned out to be the interaction between the number of dependants and the years of service with a p-value of 0.087 and SC of 1310.

#### 4.8 Testing the statistical significance

Tests of the statistical significance of each independent variable are provided. The Wald chi-square test (and its associated p-value) are shown along with the parameter estimate and standardised parameter estimate. As with linear regression analysis, the parameter estimate can be conceptualised as how much mathematical impact a unit change in the value of the independent variable has on increasing or decreasing the probability that the dependent variable will achieve the value of one in the population from which the data are assumed to have been randomly sampled.

Table 9

*Maximum likelihood estimates*

<i>Analysis of maximum likelihood estimates</i>						
<i>Parameter</i>	<i>Level</i>	<i>Estimate</i>	<i>Standard error</i>	<i>Odds ratio</i>	<i>Wald chi-square</i>	<i>P-value</i>
<i>Intercept</i>		-3.7218	1.0457	-	12.6672	0.0004
<i>cc_band</i>	<i>1</i>	2.9122	0.6711	18.39723	18.8281	<.0001
<i>cc_band</i>	<i>2</i>	3.4924	0.6553	32.86473	28.4045	<.0001
<i>cc_band</i>	<i>3</i>	3.6854	0.6947	39.86106	28.1472	<.0001
<i>cc_band</i>	<i>4</i>	4.1085	0.6443	60.85537	40.658	<.0001
<i>cc_band</i>	<i>5</i>	4.2905	0.6686	73.00296	41.1778	<.0001
<i>cc_band</i>	<i>6</i>	4.3267	0.6495	75.69408	44.3747	<.0001
<i>cc_band</i>	<i>7</i>	5.3962	0.6558	220.5667	67.7162	<.0001
<i>Performance score</i>		-0.0151	0.00798	0.985013	3.5905	0.0581
<i>Years' _service</i>		-0.0229	0.0106	0.97736	4.6601	0.0309
<i>Years' _service*kids</i>	<i>1</i>	0.0176	0.016	1.017756	1.1978	0.2738
<i>Years' _service*kids</i>	<i>2</i>	-0.0127	0.0175	0.98738	0.5284	0.4673
<i>Years' _service*kids</i>	<i>3</i>	-0.012	0.0418	0.988072	0.0818	0.7748

To test the prediction, the chi-square test statistic for the predictor performance score was 3.59 with an associated p-value of 0.0581. If the alpha level had been set to 0.05, it would have failed to reject the null hypothesis and concluded that the difference in performance has not been found to be statistically different for employees who leave and those who stay.

#### 4.9 Odds ratio estimates

Next, the effect size of the relationship was estimated by using odds ratio. The odds ratio gives the increase or decrease in probability that a unit change in the independent variable has in the probability that the event of interest will occur. It shows the

strength of association between a predictor (independent variable) and the dependent variable. Breaugh (2003) indicates that it could vary from 0 to infinity and, if the odds ratio is one, there is no relationship.

#### 4.9.1 Cost-centre bands

Due to the sheer number of cost centres/departments in the organisation, the individual cost centres were put into homogenous bands (see Table 10). These bands were used to classify cost centres with the lowest and highest turnover on a scale of 0 (lowest) to 7 (highest). Table 7 indicates association between the predictor and the explanatory variables identified for inclusion in the model.

Table 10

*Odds estimate ratio*

Odds ratio estimates	
Effect	Point estimate
cc_band 1 vs. 0	18.397
cc_band 2 vs. 0	32.864
cc_band 3 vs. 0	39.863
cc_band 4 vs. 0	60.857
cc_band 5 vs. 0	73.002
cc_band 6 vs. 0	75.694
cc_band 7 vs. 0	220.561
Performance score	0.985
Years'_service	0.977360215
Years'_service*kids 1	1.017755793
Years'_service*kids 2	0.987380305
Years'_service*kids 3	0.988071713

In the model building process, the cost-centre variable was the most powerful and the large difference in turnover between the cost-centre bands (as indicated in Table 7). For example, an employee whose cost centre fell in CC Band 7 was 220 times more likely to leave the organisation than an employee in Band 0. Not only was this effect large, but it was highly significant ( $p\text{-value} < 0.001$ , Table 6).

#### 4.9.2 Performance score

Table 7 indicates that for every 1-point increase in performance score, the likelihood of turnover decreased by 2% ( $1-0.98=0.02=2\%$ ). This effect was also turnover significant with a p-value of 0.0581.

#### 4.9.3 Years of service

Table 7 indicates that for every year of service the likelihood of turnover decreased by 3% ( $1-0.97=0.03=3\%$ ). This effect also seemed to be very significant with a p-value of 0.0309. The interaction between years of service (continuous variable) and the number of dependants (categorical variable) was turnover-complex and warranted a detailed discussion to understand its effect. To this end, simultaneous regression was used.

#### 4.10 Simultaneous regression

The logistic regression models were computed using simultaneous regression to identify the strongest predictors of turnover with other potential predictors held constant. The results appear in Table 11.

Table 11

*Effect of number of children on years of service*

	<b>The effect of number of children on years of service</b>	
Number of children	Final coefficient for years of service	Odds ratio
0	-0.0229	0.97736
1	-0.0053	0.994714
2	-0.0356	0.965026
$\geq 3$	-0.0349	0.965702



Table 11 shows the effect of the number of children variable when it is allowed to change and years of service is held constant. When the employee has no children, the effect is as before in and the odds of leaving are 2.26% ( $1-0.97736=2.264\%$ ) less likely for each successive year of service. If the employee has one child, then these odds change with each successive year of service, only making the odds of leaving 0.53% ( $1-0.994714=0.005286$ ) less likely. Similarly, the odds of leaving are 3.5 % ( $1-0.965026=3.4974\%$ ) and 3.42% ( $1-0.965702=3.4298\%$ ) less for each successive year of service when an employee has two and three or more children respectively.

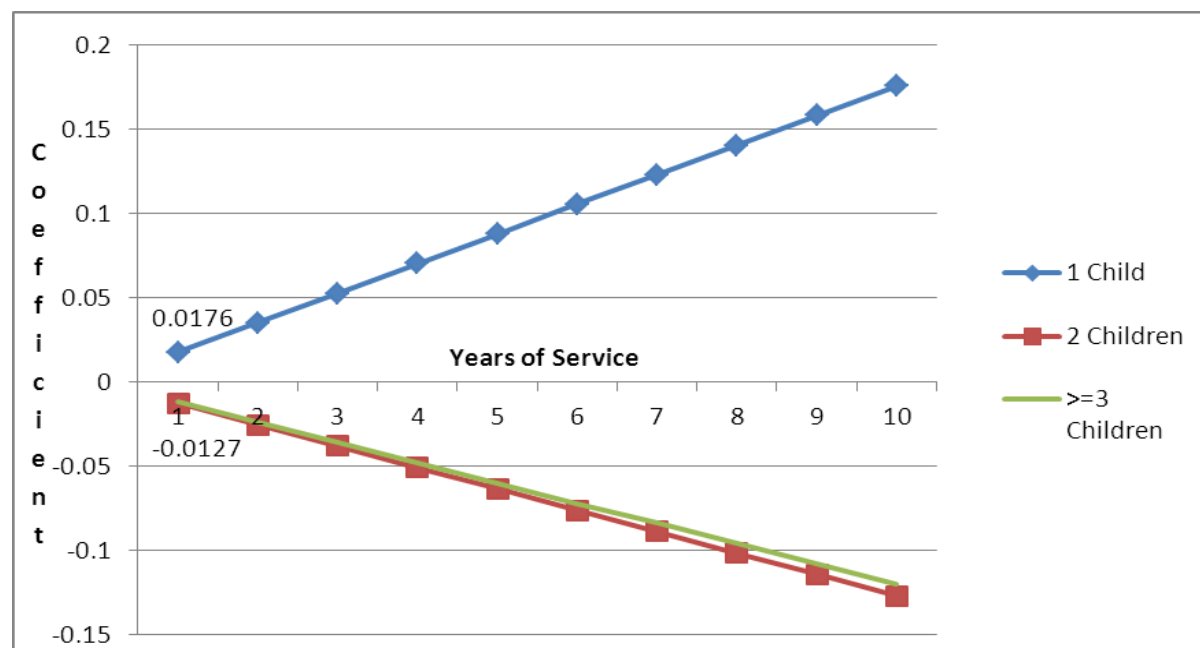


Figure 14 Effect of additional years of service

Figure 14 graphically depicts the effect of an additional year of service when the number of children remains constant (as previously discussed). The effect of having an additional child (moving from one level of the categorical variable to the next) can be calculated by finding the vertical distance between two lines. It is clear then that this effect is not constant and changes over time.

Suppose that an employer moved from having had one child to two children after exactly one year of service. The coefficient of the interaction term would then change from 0.0176 to -0.0127. Thus, the coefficient decreases by 0.0303 resulting in the odds of leaving decreasing by 2.98% ( $1-\exp(-0.0303) = 0.029846$ ).

If this had happened after 10 years of service, the coefficient would have changed by 0.303 and the odds of leaving would have decreased by 26.14% ( $1 - \exp(-0.303) = 0.261401$ ). In other words, the change of the coefficient is the product of the years of service and difference between the coefficient estimates for each level of the categorical variable. The change in the odds ratio can then be calculated accordingly.

#### 4.11 Model testing

After estimating, the coefficients there were several steps involved in assessing the appropriateness, adequacy and usefulness of the model. First, the importance of each of the explanatory variables was assessed by carrying out statistical tests of the significance of the coefficients. The overall goodness of fit of the model was tested. Then the ability of the model to discriminate between the two groups defined by the response variable was evaluated.

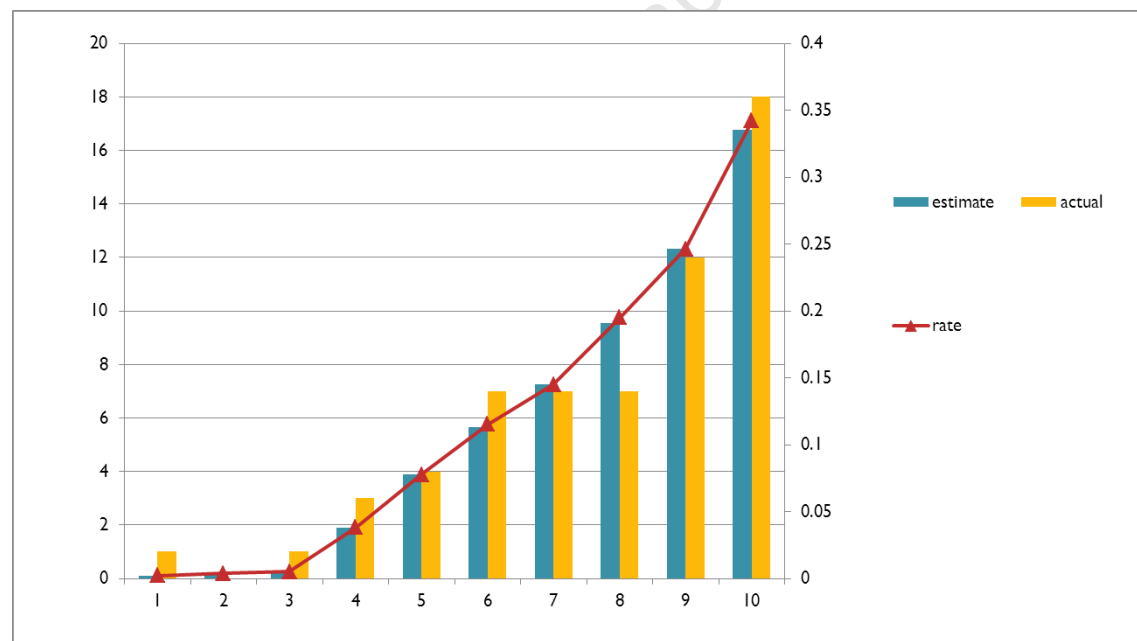


Figure 15 Comparison of actual and predicted resignations using the test set.

In the Figure 15, actual resignations are shown on the right and predicted resignations are shown on the left. Aside from testing the model graphically to test predictability, goodness-of-fit tests were performed. All of these confirmed the fact that the model does fit the turnover data well.

#### 4.12 Test results

The results of the tests can be found in the tables below.

Table 12

*Hosmer and Lemeshow goodness-of-fit test*

Hosmer and Lemeshow goodness-of-fit test		
Chi-square	DF	Pr > Chi sq
5.8890	8	0.6597

Table 13

*Deviance and Pearson goodness-of-fit statistics*

Deviance and Pearson goodness-of-fit statistics				
Criterion	Value	DF	Value/DF	Pr > Chi sq
Deviance	1277.3333	2060	0.6201	1.0000
Pearson	1915.4071	2060	0.9298	0.9892

Table 14

*R-square*

<b>R-square</b>	0.1332
<b>Max-rescaled R-square</b>	0.2591

The pseudo R-squared for the model was low but the other tests (Tables 12 and 13) seem to indicate that this was a result of its shortcomings in the context of logistic regression.

#### 4.13 Final notes

To summarise, the database was synchronised in order to match records for all unique employee numbers in order to examine each employee for the period of years of service in the organisation. This resulted in a data set consisting of 2 592 unique employees. Prior to any analysis, the data set was coded, using classification techniques for dichotomous and categorical variables. Data mining techniques were used to investigate the variables that influenced employee turnover. The first step was to perform descriptive analysis techniques in order to gain a better understanding of the total population under study.

The descriptive analysis was conducted using all selected independent variables. A series of exploratory data analyses (EDA) was conducted in order to identify significant relationships and to eliminate predictor variables that did not influence the model. Next, the study employed logistic regression to identify significant variables. The variables that were eventually included in the model are:

1. cost-centre band;
2. years of service;
3. age band;
4. performance score; and
5. interaction (number of dependants and years of service).

Maximum likelihood estimates were employed since this was deemed the most appropriate analysis method for large data sets with dichotomous variables (Allison, 2002). These analyses yielded results enabling comparison across the various dichotomous dependent variables that could be used to predict turnover.

## **CHAPTER 5**

### **DISCUSSION AND RECOMMENDATIONS**

#### **5.1 Introduction**

This study sought to empirically assess the impact of demographic variable (available in organisation's HR system) on employee turnover. Employees did not share the same turnover probability and consequently the aim of this investigation was twofold:

- 1) to identify the salient factors of employee turnover (within the framework of the study);
- 2) to investigate whether demographic variables, which are statistically relevant, could be used to build a predictive employee turnover model.

Tightening market conditions, increased competition and decreasing profit margins are reflected in the HR policies of organisations. Management expecting of HR departments to come up with solutions that will not lower the performance of the company but which will lower business costs.

In the present study, logistic regression analysis was employed to predict the probability that an employee would voluntarily leave the organisation. The model used all selected variables; however, the model that emerged from the analysis showed that only four variables were significant in predicting voluntary turnover of the employees, i.e. cost centre, years of service, performance and interaction between years of service, and number of dependants and age.

Each one of the five variables are discussed in greater depth, followed by a discussion of the excluded variables, and the section concludes with the limitations and suggestions for future research.

#### **5.2 Research proposition**

There is moderate support for the research proposition, i.e. demographic variables can predict employee turnover. Fourteen variables were tested in this study, and only five were found to be useful to build a model.

These five predictive variables were identified as cost centre, years of service, performance and interaction between number of dependants and years of service. The inter-correlations application between dependent and explanatory variables revealed some likely and surprising significant relationships. The variables contained within the predictive model are discussed followed by a discussion on the excluded variables.

### **5.3 Significant demographic variables in the turnover study**

#### **5.3.1 Age**

Literature supports that demographic characteristics seem to influence employee decisions to leave an organisation. For example, mature workers are less likely than younger ones to intend to leave an organisation. Younger employees have higher turnover rates as a result of shifting career paths, flexibility to relocate, and fewer family responsibilities and financial obligations (Lewis 1991). Generational differences also encourage younger employees to change jobs and sector of employment frequently after earning their degrees (Peralto & Stark, 2006). As Generations X and Y place less value on stability and benefits, there is a greater likelihood of turnover among those groups (Lewis & Frank, 2002).

In the current logistic regression study, no assumptions were made about the distributions of the explanatory variables. The explanatory variables should not be highly correlated with one another because this could cause problems with estimations. The age variable could not be fitted to the model because years of service was already included and the two are highly correlated. The differences in turnover and attributable to age were clear. Employees younger than 35 years had higher turnover rates than their older colleagues, with the propensity to leave actually increasing with age amongst the younger employees. The main argument for this observation was that the available time to amortise the costs related to a change in employment declines with age, thus making a job change more risky (Sousa-Poza & Henneberger, 2004).

### 5.3.2 Years of service

According to traditional research, years of service has consistently been found to be negatively related to turnover (Steers, 1977; Steel & Ovalle, 1984; Griffeth et al., 2000). The highest turnover is experienced in the first five years of employment (see Figure 8). New employees take time to adjust to their work environment. At the same time, they are still evaluating their decision on whether joining the organisation was the right career choice. In addition, in the first few years of employment, new employees would not have financially invested in the organisation. Their pension fund and other benefits would not have accrued to where leaving the organisation would disadvantage them financially. Therefore, job mobility becomes easier.

The research confirmed that after every year of service, voluntary turnover decreases. A p-value of 0.0309 meant years of services was included in the model. While age and years of service are positively correlated, they are not identical constructs (Ng & Feldman, 2009). Nonetheless, older workers with high years of service may have particularly strong financial reasons to remain with their current employers. Provisions of good compensation benefits are offered to employees with long years of service in order to retain them. Ng and Feldman (2009) suggest that these rewards discourage employees from seeking alternative opportunities. While older workers are less likely to leave their organisations in general, those with long years of service are especially less likely to do so because of financial incentives.

Job tenure (referred to as years of service) also seems to have a strong negative influence on turnover (Blau & Kahn, 1981; Cotton & Tuttle, 1986; Lewis 1991; Sorensen, 2000; Lambert, Hogan & Barton, 2001). Turnover is greatest at the earliest stages of employment, but it declines rapidly over the first five years and then more slowly up to about 15 years of service (Lewis, 1991). A principal explanation for this trend is that social interaction in the workplace tends to engender affinity and loyalty toward the organisation and its members, thus reducing the propensity for turnover (Sorensen, 2000). As an employee remains with an organisation over time, he or she will be motivated to respond to changes within it by exiting, voicing concern, or remaining loyal. Once an employee has a certain number of years of experience in

employment, he or she may refrain from leaving or retiring early out of consideration for the potential loss in retirement earnings.

### 5.3.3 Cost centre

Cost centre refers to an organisation unit where all costs related to a group of people are managed. It could be a specific department but within that department, a few cost centres may exist. Bands were used to classify cost centres with the lowest and highest turnover on a scale of 0 (lowest) to 7 (highest). The inclusion of this variable in the model was unexpected but not unexplained. Table 11 shows which business unit contributes most to a particular (turnover) band.

Table 15

*Cost-centre band and turnover*

Business Unit	Cost Centre Band								Total
	0	1	2	3	4	5	6	7	
Broker Distribution	97	6	4	2	7	8	15	15	154
Business Change Unit	9	0	0	1	0	0	0	0	10
Claims Services	46	7	4	5	8	3	7	9	89
Corporate Services	15	0	2	1	1	2	2	2	25
Executive Office	2	0	0	0	0	0	0	1	3
Information Technology	9	1	1	0	3	0	0	1	15
Market Development	1	0	0	0	0	0	0	2	3
People and Brand	6	0	2	1	0	0	2	4	15
Risk Services	12	2	1	2	2	1	2	1	23
Special Projects	1	0	0	0	0	0	0	0	1
Specialist Business	13	1	1	1	4	1	1	6	28
Total	211	17	15	13	25	15	29	41	366

As broker distribution has the largest amount of cost centres, it will almost always be the largest contributor to a turnover due to the size of the business unit (N=1 066). Table 15 also shows that within business units, e.g. business change, there is very little likelihood of turnover. Table 15 indicates that there is not much turnover in all its cost centres falling into bands 1 and 2. Broker distribution, claims services and specialist business appear to have cost centres, which have high turnover. Within these business units, there are specific cost centres that have a higher predictive turnover probability than other cost centres, e.g. band 7.



These cost centres are based in Gauteng. Possible explanations could include all of the traditional turnover factors, including leadership, job satisfaction and commitment, worker engagement, employee benefits and the nature of the work. People working in Gauteng are more susceptible to turnover than people living anywhere else. This could be explained by the fact that Johannesburg offers more available alternative career opportunities because it is where the big South African and some international offices are based.

#### **5.3.4 Performance**

The findings suggest that voluntary turnover can be predicted based on performance ( $p\text{-value}=0.0581$ ). The performance–turnover relationship (i.e. positive, negative or no relationship) is supported by literature. The literature advises the performance–turnover relationship should consider performance slopes when predicting turnover (Sturman & Trevor, 2001). Alternatively, other researchers suggest that the performance–turnover relationship may be of greater importance in the intermediate stages of employment (Kanfer, Crosby and Brandt, 1988). In the current research, turnover was highest within the first five years of employment, which makes this a crucial period in retention.

The findings of this study strongly support the positive relationship, i.e. the higher the performance, the less likelihood of turnover. However, the performance–turnover relationship (see Table 5) indicates the variable is useful in the final model but its effect is likely to be marginal.

#### **5.3.5 Interaction (number of dependants and years of service)**

The last component of the model is the relationship between years of service and number of dependants. In order to test for moderating effects, this study adopted a regression procedure. The method is that both categorical (e.g. years of service) and continuous (e.g. organisational years of service) moderator variables can be included. Employees who have same number of years of service and differences in the number of dependants show an equal likelihood of turnover.

#### **5.4 Variables not included in the model**

The major conceptual constraint of all regression techniques is that one can only ascertain relationships, but never be sure of the underlying causal mechanisms (StatSoft). To make sense of the numbers it is useful to refer to the literature and ascertain how the statistics support or question the literature. Based on the small number of variables present in the model it is useful to list and discuss the variables excluded from the model.

Research indicated that black employees have a higher turnover rate than whites; however, this should be viewed relative to the number of black employees present in the sample (see Table 4). An interesting theory is indicated by Kane-Sellers (2008) that voluntary turnover may not be determined by individual race, but by the ethnic composition of the organisation. If so, this supports the importance of demographics within the organisation. This could also be applied to language, where the data indicated that people speaking a South African black language had a higher turnover rate (see Figure 5). Despite these findings, gender, race and language did not feature in the model as predictive variables. The literature review showed a trend for turnover to be more likely amongst certain groups and in the current research, this group comprised single people who were Indian (see Figure 7).

#### **5.5 Critical evaluation of the model**

The results support the idea that having a model is better than having no model at all. The fact that only a few variables were included in the model raises significant questions, which are listed with possible explanations:

## **1. Why does the model not support the literature more strongly?**

In the data exploration phase of the study, there was clear support for demographic variables and turnover. However, in the predictive model, there was less support for the demographic variable–turnover relationship.

- *Exclusion of variables*

The study did not consider several variables that have been identified in the management and labour economics literature to be important determinants of turnover. These include wages, wage growth, education status and prior mobility (Ledolter & Power, 1984). Of these, wages and wage growth are probably most important for actuarial applications.

- *One-dimensional model*

A primary limitation was that the model was one-dimensional. It was developed using only data available internally within an organisation. The data did not directly capture influences from the macro environment that might have had an impact on employee turnover. Neither did the research focus on any of the traditional turnover models.

## **2. Which impact did the statistical techniques have on the final model?**

This study has a number of strengths. The sample was large, with data collected over a three-year period and the utilisation of sophisticated statistical modelling. There are numerous predictive modelling techniques for predicting the occurrence of an event. These vary in terms of statistical method (e.g. neural nets versus logistic regression), variable selection method (e.g. theory versus stepwise selection), number of variables included in the model, and time spent in total on the modelling exercise as well as the way a given time budget is allocated across various tasks in the model-building process (Neslin, Sunil, Kamakura, Lu, & Mason, 2006).

## 5.6 Study contributions and implications

Human resources departments require a new breed of analytics and modelling to move beyond data reporting to predicting future events to shape the outcomes. This study showed that this technique could:

1. Provide HR with a tool in the retention challenge.
2. The model used in this study could be used as a decision-making tool to produce information in terms of:
  - workforce planning;
  - generating reports that show how loss of critical skills would affect an organisation;
  - identifying job groups, geographical regions or organisational areas that have higher risk for employee voluntary termination; and
  - identifying the influential drivers to high-risk groups in order to suggest the best course of action to reduce the risk.

The model could be a decision-making tool that allows an organisation to ask the following questions:

1. Are high-risk employees occupying a critical role in the organisation?
2. Do high-risk employees have skills that are difficult to replace?

The current study attempted to predict employee turnover by developing a mathematical-based understanding of employee turnover. The model can guide the organisation when deciding which workforce segments should be approached in retention campaigns and implementation of segment-specific retention strategies. Through predicting turnover propensity, the organisation is likely to manage its human capital risks (Boudreau, 2010).

## **5.7 Limitations**

The research study was limited to a few aspects. Firstly, the study considered only limited variables while assessing employee turnover. Critical variables, e.g. qualification and salary were excluded. Secondly, the sample was limited to one general insurer organisation. It may not be appropriate to generalise the findings across other populations or settings. However, the sample can be viewed as a representative case typical of many other organisations in the same industry.

## **5.8 Future research**

Other demographical data and test results may be considered to improve the accuracy of the prediction or generate other potentially useful rules. Further research is suggested to the scope to apply this basic model to a greater number of organisations in similar industries. However, in this application, the following should be considered:

- analysis using survival analysis techniques, or duration analysis, could enable more precise prediction;
- inclusion of external data would add a further dimension to turnover prediction e.g. data related to economic conditions or job market conditions; and
- inclusion of salary information data (Doran, Stone., Brief, & George, 1991; Cho & Ngai, 2003).

The major barrier hindering companies from implementing human resources analytics is not a lack of data on employees – salary information, performance reviews and education level – but siloed employee data. Many human resources departments have sidestepped IT and used SAS-based applications to manage different types of employee data, which are difficult to connect to internal data sources like payroll systems. The result is a collection of disparate employee data that is nearly impossible to aggregate for analysis.

Calculating the return on investment ROI of HR analytics is also difficult precisely because many HR systems and applications are not integrated with financial systems. A lack of historical data against which to compare HR analytic results also makes measuring ROI tricky, but a change of even a percentage point or two in employee retention or turnover can have a significant financial effect (Mak & Sockel, 2001).

Alternative data mining techniques such as neural networks can be studied in future research to compare various approaches and these techniques may be integrated for better exploration of complex interrelationships among the input personnel variables and target work behaviours (Sexton, McMurtrey, Michalopoulos, & Smith, 2005). For researchers, an implication of this work is the importance of a modelling technique. The academic literature pays much consideration to statistical techniques, e.g. various types of neural net or logistic models (cf. Kumar, Vithala, & Harsh, 1995). The research supports these efforts, but also points toward the need to understand methods of variable selection and the model building process (Neslin et al., 2006).

A statistical technique such as decision trees can be very successful, but success occurs only if the statistical technique is coupled with a lot of time allocated to estimating the model. A user of decision trees would presumably meet with less success if he or she should allocate more time to data cleaning and creating variables rather than estimation.

Another avenue of future research is to investigate how well the technique identified in this study generalises to other samples.

## 5.9 Conclusion

Can 'people data' be used to create value?

Even though the organisation does not have a higher turnover rate, any turnover in South African context is significant. Financial services have the highest qualification requirement; therefore, turnover at any level is concerning. The present study makes a practical and methodological contribution to the turnover literature. Given the cost implications and negative consequences of turnover to organisations, it is critical that more research be carried out in the area of turnover and that a model be formulated to enhance prediction. The results obtained during the current study were not entirely consistent with the literature that suggests some demographic variables as predictors of turnover. Prior research had offered mixed conclusions based on both theoretical and empirical analysis on the demographic–turnover relationship. It becomes evident that a prediction model can be built; however, factors that are more comprehensive need to be included.

The current findings provide partial support for the predictive model in explaining employee turnover. Five out of the fourteen predicted relationships were significant. The variables that are perceived as predictors of turnover, e.g. race and gender, had no significant effects. For practice, perhaps the most basic yet important conclusion is that organisations should constantly be on the lookout for better prediction techniques.

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